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ON THE

WASTING DISEASES

OF

INFANTS AND CHILDREN.

BY

EUSTACE SMITH, M. D. LOND.

MEMBER OF THE ROYAL COLLEGE OF PHYSICIANS;
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TO

SIR WILLIAM JENNER, BART., M.D., D.C.L., F.R.S.

This Volume is Inscribed

WITH RESPECT AND GRATITUDE

BY THE AUTHOR.

PREFACE.

THE extensive use of such terms as "marasmus," "tabes," "atrophy," as denoting vaguely some slow disease fatal to children, affords a strong presumption that diseases of which wasting is a prominent symptom, are but little understood; and that much loss of life is due to insufficient knowledge of their nature.

The Author had not long begun the study of children's diseases before he found that even the best systematic treatises dealt but imperfectly with the clinical condition of chronic wasting, and did not consider together—in the way required for every-day use in practice—the various disorders to which it may be due.

He was, accordingly, induced to devote considerable attention to this subject, with the view of forming some practical classification, by means of which the diseases giving rise to this slow wasting might be more readily recognized and controlled.

As a result of the experience thus acquired, he offers the present volume as a contribution to the literature of the diseases of children, in the hope that it may be found of practical value in the treatment of this exceedingly common and fatal condition.

In the chapter on pulmonary phthisis, the Author has endeavoured to utilize recent views on the nature of the phthisical process; but as his aim has been primarily to make his little book clinically useful, he has limited himself to matters of direct practical significance, and has indulged little in considerations of a purely speculative kind.

28 George Street, Hanover Square.
September, 1868.

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ON

THE WASTING DISEASES

OF

INFANTS AND CHILDREN.

INTRODUCTION.

WASTING a sign of defective nutrition—Importance of detecting the cause of malnutrition—Wasting not always the first sign, and may even be absent in slight cases—Defective nutrition may be the result of acute disease—Liability of badly-nourished children to secondary acute diseases—Peculiarities of these secondary diseases—Insensibility of the nervous system in cachectic children—Infrequency of reflex convulsions—Importance of diagnosing the secondary diseases—Information to be derived from examining the face of the infant—M. Jadelot's "traits"—Colour of face—Breathing—Cry—Causes of large belly in infants—Infrequency of mesenteric disease—Mode of examining liver and spleen.

General Treatment of Wasting.—Uselessness of tonics so long as there remains any derangement of the stomach or bowels—Importance of minuteness in giving directions about diet. *External Applications.*—Frictions—Counter-irritants—Baths—Hot—Mustard—Cold. *Internal Remedies.*—Cod-liver oil must not be given in too large doses—Stimulants.

WASTING is a sign of defective nutrition: the waste of the body continues, but new material is introduced in quantity insufficient to supply the loss of tissue.

In every case of wasting in a child the cause should be carefully inquired for, as the defect in nutrition can only be effectually remedied by removing the cause which has produced it. This cause may be unsuitable food, the child being actually starving from his inability to digest and assimilate the diet with which he is supplied. He may be prevented from assimilating an ordinarily digestible diet by some unhealthy condition of his alimentary canal; or some constitutional defect, as the existence of tuberculosis, or the poison of syphilis pervading the system, may interfere with the proper nutrition of the tissues.

It is extremely important to detect the earliest symptoms of defective nutrition. Wasting is not always one of the first signs, and may even be altogether absent if the interference with nutrition is not carried to a high degree. Thus, a child may be exceedingly plump, and may even excite admiration by his good condition, although he may at the same time be suffering from the insidious commencement of rickets, which, if the causes producing the disease continue unchecked, will shortly assert itself unmistakably. Acute disease is frequently a starting point for mal-nutrition, either by awakening a dormant diathetic tendency, or by leaving behind it a chronic derangement of the alimentary canal, or by impeding nutrition by some mysterious influence over nervous power. Thus measles and hooping-cough not unfrequently excite the manifestations of a previously latent tubercular tendency; scarlatina and measles are apt to be followed by obstinate diarrhœa; and diphtheria is sometimes succeeded by a loss of nervous power, usually indeed local, but sometimes general and sufficiently serious to interfere with the working of all the functions of the body.[1]

In every acute disease there are, therefore, two dangers: the immediate danger, and the remote danger. The first presses itself upon our notice, and cannot be overlooked; the second, obscured by distance, is apt to be disregarded. Acute disease always excites attention and receives immediate treatment, but it is not enough to rest satisfied with the cessation of pressing symptoms. There is always the danger that the defective nutrition, at first merely temporary, may become confirmed; in other words, that chronic disease may be established.

One consequence of the weakly condition to which badly nourished children are reduced is their liability to secondary acute diseases. In a child suffering from the results of chronic interference with nutrition, from whatever cause, the power of resisting new injurious influences is very much impaired. In such a state he is constantly found to be affected by causes so slight as to pass almost unnoticed, and which in a healthy child would be completely powerless to do harm. If the emaciation and debility of the child are very great, these secondary diseases may give very little evidence of their presence; for an infant reduced by mal-nutrition to a cachectic state loses many of the vital characteristics of early childhood, especially the intense excitability of the nervous system which is so striking a peculiarity of healthy infancy. In a robust child we constantly find the whole system suffering violently from sympathetic derangement set up by some trifling disturbance. A lump of indigestible food, or a slight impression of cold, will not unfrequently produce burning fever, and alarming nervous symptoms, as delirium, convulsions, or even a state approaching to coma. On the other hand, in an infant much reduced by long-continued impairment of nutrition, the most serious diseases may give no signs of their presence. Pneumonia may exist with little fever and no cough, and a serious intestinal lesion without pain and with only trifling diarrhœa.[2]

---

[1] On Diphtheria. By Sir William Jenner. London, 1861, p. 46.

[2] Rilliet et Barthez. Maladies des Enfants. Vol. i. p. 19.

A good example of the insensibility of the nervous system to local impressions is seen by attempting the well-known experiment of gently stimulating the genito-crural nerve, described by Sir William Jenner in his Lectures on Rickets.[1] In a healthy child the finger-nail drawn lightly along the upper two-thirds of the inner aspect of the thigh produces an instantaneous rise of the testicle of that side, by the action of the cremaster muscle which draws it up close to the external abdominal ring. In a cachectic child the same experiment is followed by no result whatever; the cremaster does not contract, and the testicle remains motionless. In such cases, therefore, there is absence of the normal excitability of the nervous system so characteristic of healthy infancy. This insensibility of the parts of the nervous system concerned in the production of reflex movements is further indicated by the infrequency of reflex convulsions in such children. In well-nourished children these are exceedingly common, and the natural nervous sensibility appears to be heightened by anything which causes a *sudden* weakening of the system, as severe acute diarrhœa, or great loss of blood. When, however, the debility is produced more slowly the same result does not follow, and the excitability of the nervous system, instead of being exalted, is more or less completely destroyed.

For this reason, acute diseases, attacking a child whose nutrition is thus seriously impaired, have a character all their own. They are distinguished by an absence of those peculiarities which we are accustomed to consider inseparable from the disorders of childhood, and resemble more the same diseases as they occur in advanced age. They begin more insidiously; run their course more slowly; give rise to fewer symptoms; and often end suddenly and unexpectedly in death. Although thus undemonstrative, they are not, however, on that account the less dangerous; indeed, the prognosis may be said to be serious in proportion to the fewness of the symptoms by which their existence is announced. By offering an additional obstacle to nutrition they still further weaken the already enfeebled constitution, and the disease, if it does not prove immediately fatal, is apt to hang on, gradually reducing the child more and more, until he sinks under its effects.

It is difficult to over-estimate the importance of an early diagnosis of these secondary disorders. On account of their insidious commencement they are frequently overlooked, and it is often only by the more rapid debility they induce that suspicions of their existence are at last excited. As the infant is unable to communicate his ideas by speech, the eye should be practised to gather from the expression and gestures of the child the information which he can communicate in no other way. A careful perusal of the face is therefore of the utmost importance. By it we can ascertain the existence of pain, and can often distinguish the part of the body which is the seat of serious disease. Thus, pain in the head is indicated by contraction of the brows; in the chest, by a sharpness of the nostrils; and in the belly, by a drawing of the upper lip.

---

[1] Medical Times and Gazette, March 17, 1860.

M. Jadelot,[1] formerly physician to the Hôpital des Enfants Trouvés at Paris, was the first to draw attention to certain "traits," or lines, which become marked on the face of a child suffering from serious disease, and the situation of which furnishes indications as to the part of the body to which it is necessary to direct our examination. The *oculo-zygomatic* line, or furrow, begins at the inner angle of the eye, and passing outwards underneath the lower lid, is lost a little below the projection formed by the cheek-bone. This indicates disorder of the cerebro-nervous system, becoming strongly marked in all those diseases whose primary seat is the brain or nerves, or in cases where those organs become affected secondarily to disease commencing in other parts.

The *nasal* line rises at the upper part of the ala of the nose, and, passing downwards, forms a rough semicircle round the corner of the mouth. Joining this at an angle about its middle is another line, called *genal*, which reaches from that point almost to the malar bone, and in certain faces forms the dimple of the cheek. These indicate disease of the digestive passages and the abdominal viscera.

The *labial* line begins at the angle of the mouth, and is directed outwards, to be lost in the lower part of the face. It is seldom so deep as the preceding. It indicates disease of the lungs and air-passages.

M. Jadelot attributed immense importance to these lines, and even stated that he had been enabled to discover the exact period at which the cough of pertussis assumed its convulsive character by the appearance of the oculo-zygomatic line upon the child's face. Without, however, attaching to them the same significance which they assumed in the opinion of their discoverer, there is no doubt that they often furnish important indications, and are, therefore, points to which attention should always be directed in the examination of a young child.

The colour of the face should be carefully noted. Lividity of the lips and of the eyelids is a sign of imperfect aeration of the blood, or may indicate digestive disturbance, or merely weak circulation. A peculiar waxy-yellow tint is seen in certain parts of the face in congenital syphilis; and there is an earthy tinge of the face and whole body in many cases of chronic bowel complaint. Exhaustion is indicated by coolness and pallor of the face, by lividity of the eyelids and mouth, and, in extreme cases, by a half-closure of the eyes, so as to leave the lower parts of the whites exposed, while at the same time the fontanelle is deeply depressed. The state of the fontanelle should be always examined, for it forms a very important guide to treatment: if much depressed, stimulants should never be withheld.

---

[1] Quoted in Dr. Dunglison's work On the Diseases of the Stomach and Bowels in Young Children.

The breathing must be watched. If rapid, and accompanied by movement of the nares, there is usually bronchitis or pneumonia, and a careful examination of the chest should always be made. Unequal movement of the two sides of the chest in respiration generally indicates a serious lesion on the side at which the movement is least. If the respiratory action of the abdominal muscles is increased, attention is at once directed to the chest. If the belly is motionless, it is often the seat of an inflammatory complication.

The cry of the infant varies very much in character. In cerebral affections it is sharp, short, and sudden. In lesions of the abdomen, exciting pain, it is prolonged. In congenital syphilis, it is high-pitched and hoarse. In inflammatory diseases of the larynx, it is hoarse, and may be whispering. In inflammatory diseases of the lungs, and in severe rickets, the child is unusually quiet, and unwilling to cry on account of the action interfering with the respiratory functions.

The infant should always be completely stripped for examination. We can then at once observe the form and play of the chest, the state of the abdomen, the condition of the skin, whether hot or cool, dry or moist, and the conformation of his limbs. Besides, any eruption upon the skin is at once detected by this means.

The large size of the belly in weakly children often attracts the attention of parents, and excites much anxiety. It is most commonly produced by accumulation of flatus, owing to the weakness of the abdominal walls. It may be also due to displacement of the liver and spleen, such as occurs so often in rickets on account of the depression of the diaphragm forcing those organs downwards from beneath the cover of the ribs. The liver and spleen may be themselves enlarged; and great masses of cancer occasionally spring from the kidney and from the other abdominal organs. Ascites may be present from tubercular or simple peritonitis, from Bright's disease, or, rarely, from disease of the liver. Tubercular peritonitis may also produce extreme tympanitis. Accumulations of fecal matters may take place in sufficient quantities to cause distension; and, lastly, the mesenteric glands may be so enlarged as to produce a visible tumour. Flatulence is, however, as has been said, by far the most frequent cause of this condition, and in children reduced by chronic disease the belly is almost always distended from this cause. The bowels are, in such cases, usually deranged; food is ill digested; and the gas set free by decomposition of the starchy matters is allowed, through the feebleness of the muscular walls, to accumulate and to give rise to much discomfort and swelling.

It is of great importance to bear in mind this simple cause of the enlargement, for a big belly in a wasting infant is constantly attributed to mesenteric disease; and it is not uncommon to hear that a child has been given over for this supposed complaint when he is in reality suffering from nothing else than bad feeding, with derangement of the bowels as its natural consequence. Setting aside the general rarity of mesenteric disease, and its extreme rarity in children under three years of age, there remains the fact that distension of the abdomen is by no means a necessary consequence of this disease. On the contrary, unless the glandular disease be great, the abdominal wall is more often retracted than expanded. It may become occasionally distended from flatus, as in all cases where the bowels are disordered, but the distension is, in such cases, independent of the affection of the glands, and is merely an accidental complication. If the increase in size of the glands is sufficiently great to produce a distinct tumour, the swelling is seated about the umbilicus, and does not occupy the whole abdomen. In all cases, therefore, where the belly is swollen uniformly, the probabilities are very strongly against mesenteric disease; and if no tumour can be detected on pressure in the situation of the glands, no foundation exists for attributing the enlargement of the abdomen to this cause. For fuller information upon this subject the reader is referred to the Article on Mesenteric Phthisis, where will also be found the method of distinguishing this disease from accumulations of fecal matter in the colon.

The size of the liver and spleen should always be investigated. The extent of liver-dulness should be estimated by percussion. If the organ descends below the level of the ribs, the hand should be laid flat upon the belly; by gentle palpation with the ends of the fingers we can then always feel the thin border, and, unless the abdominal wall be very tense, can generally succeed in inserting the tips of the fingers underneath the sharp edge.

The size of the spleen is very easily estimated. The fingers of the right hand are placed at the back, directly below the twelfth rib, and just outside the mass formed by the lumbar muscles; the fingers of the left hand are placed exactly opposite the former, in front of the belly; by pressing the two hands towards one another, the spleen, if it is enlarged, is caught between them. If the hands have been rightly applied, and the spleen is not felt, it may be considered to be of natural size.

It must be remembered, however, that both these organs may be felt more readily than is natural without being necessarily enlarged, as they may be displaced by pressure of the diaphragm.

In the *treatment* of chronic wasting in a young child our first care should be to remove any derangement of the stomach and bowels. For this object a strict regulation of his diet is indispensable. In the great majority of such cases the cause can be distinctly traced to improper feeding, and therefore an alteration in the diet is the first step to a cure. Tonics given to a child whose bowels remain disordered are perfectly useless, for, so long as the derangement of the alimentary canal continues, nutrition cannot be restored on account of the impediment thus presented to the digestion and assimilation of food.

Directions on the subject of diet cannot be too precise; it is necessary to state distinctly, not only the articles of food to be given, but the quantities to be allowed at each meal, and the frequency with which the meals are to be repeated. It is advisable to write down all such directions that misunderstanding may be avoided; in fact, the same attention should be paid to this subject as is paid to the ordering of drugs.

After the diet has been altered to suit the requirements of the case, more special treatment is called for, and the means at our command may be divided into two classes, viz., external applications, and internal remedies.

External applications are of great service in all chronic diseases, for it is important to restore as quickly as possible the healthy action of the skin. For this purpose, frictions, counter-irritants, and baths, hot or cold, may be used.

Frictions can be employed with the hand alone, with stimulating liniments, or with cod-liver oil. By this means the circulation is rendered more vigorous, and the action of the skin is promoted. The feebleness of the circulation in most cases of chronic disease in the infant is shown by the coldness of the extremities. When these have been warmed by suitable applications, the beneficial influence is often very decided; pain in the belly ceases, and the child usually falls into a quiet sleep. The frictions should be used to the whole body if there is no tenderness. In cases of rickets, however, this cannot at first be borne, as in that disease there is extreme tenderness, which renders the least movement or pressure painful to the child. When, however, the disease is improving, frictions are exceedingly useful, and should never be neglected. Friction with stimulating liniments is merely a mild form of counter-irritation which can be applied generally, and has a more powerful influence in stimulating the circulation, and promoting a flow of blood to the surface, than friction with the hand alone. It is useful in all cases where the debility is great.

Friction with cod-liver oil is valuable as a means of introducing nourishment into the system, and when the irritability of the stomach is great this is a very useful means of administering the oil.

In the application of counter-irritants to young children great care must be taken not to carry the counter-irritation too far. An irritant which, in a healthy child, would produce only a moderate degree of redness, will often, where the strength is much reduced, set up very great inflammation, or even produce sloughing of the tissues. Such a result would not only still further reduce the child's little remaining strength, but would act as a direct irritant to the part for which it is intended to be a derivative. For this reason counter-irritation should, as a rule, be general rather than local, being employed in the form of stimulating liniments and hot baths. Sometimes, however, a local counter-irritant is required. In these cases equal parts of flour of mustard and linseed meal should be used. Blisters are inadmissible for infants.

For the hot bath, the water should be of the temperature of from 95° to 100° Fahr., and should be sufficient in quantity to cover the child up to the neck. After remaining in the water for three, four, or five minutes, he should be quickly but thoroughly dried, and be then wrapped in flannel and returned to his cot. It is of great importance that he should not be left too long in the hot water. The effect of the hot bath is at first stimulating, but after stimulation comes reaction, and depression is induced. He must be, therefore, removed before the stimulating effect has had time to pass off. Children, especially when unwell, often show great repugnance to the bath, and become much terrified at the sight of the water. In these cases it is convenient to cover the bath with a blanket; the child, being placed upon this, can be lowered gently down into the water without seeing anything to excite his apprehensions.

Sometimes a more powerful stimulant is required. In these cases the child should be wrapped in flannel wrung out of hot water, and upon which some flour of mustard has been sprinkled; the whole being covered with a dry warm blanket. Or the mustard bath recommended by the late Prof. Trousseau may be adopted.[1] For this, some flour of mustard is mixed with cold water, and is put into a linen bag. The bag is then squeezed in the bath, and the water becomes strongly sinapized. The child is held in the warm water until the arms of the person supporting him begin to prick and tingle. The quantity of mustard required for this bath is in the proportion of two ounces to five gallons of water.

The immediate effect of the *cold* bath is directly contrary to that of the hot bath. Its first effect is depressing, on account of the shock. In a few seconds, however, reaction succeeds to the temporary depression, the surface of the body glows, and the pulse becomes fuller and stronger. It acts, therefore, as a general stimulant and tonic, promoting nutrition, and giving tone to the body. If continued too long, reaction subsides, and there is a sense of chilliness and languor, with loss of appetite, which may last for several hours. The shock is great in proportion to the coldness of the water, and the degree of weakness of the patient. The addition of salt to the water makes it more stimulating, and increases the vigour of the reaction.

On account of these effects the cold bath should be used with caution, and is inadmissible until the child is far advanced towards convalescence. It then becomes a valuable means of invigorating the system. The water should not at any time be below the temperature of 60° Fahr., and should be used tepid at the first, the temperature of succeeding baths being gradually reduced as the child gets stronger. Any chilliness or languor after the bath are signs that too cold water has been used, or that the bath has been continued too long. To be beneficial the whole process should be rapid. The child should be quickly sponged, and should then be dried briskly with a thick soft towel. The whole body should be afterwards well and firmly rubbed with the open hand to assist the reaction.

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[1] Clinique Médicale.

Of internal remedies little need be said in this place, as full directions will be given afterwards in considering the treatment of the different diseases. The important point to remember is the uselessness of tonics so long as any derangement of the digestive organs remains uncorrected. In order that tonics may be beneficial, the stomach and bowels must be in a healthy state. It is only when digestion is restored that these remedies are admissible; they will then prove of extreme service, increasing the vigour of the stomach, and improving the tone of the whole body.

To the general list of tonics, cod-liver oil is an important addition. It is, indeed, more a food than a medicine; but for this very reason it should not be given in too large quantities. If more of the oil is being taken than can be digested, the surplus passes down through the bowels, and is seen unchanged in the stools, where it is at once recognized by its appearance and smell. In administering the oil our object should be to give as much as can be readily digested, but no more. For a child under two years of age ten drops will be a sufficient dose at the first. The quantity, after the first few days, can be gradually increased, but a careful watch must be kept upon the stools, and the appearance of any oil unchanged in the evacuations is a sign that the quantity must be reduced. For a child of this age we can seldom go beyond thirty drops for the dose, three times in the day.

With regard to stimulants; they are always required when the fontanelle becomes much depressed. The best form is pale brandy, of which a few drops (five to ten) may be given in cold water or a little milk, as often as circumstances seem to demand the repetition.

CHAPTER I.

SIMPLE ATROPHY FROM INSUFFICIENT NOURISHMENT.

SIMPLE ATROPHY FROM INSUFFICIENT NOURISHMENT.—An exceedingly common condition.—Causes—Insufficient supply of food—Varieties of breast milk—Effect of preponderance of butter in the milk—Test of a good nurse—Unsuitable food—Dependence of nutrition upon power of digestion—Over-feeding—Varieties of food required for perfect nutrition—Differences between woman's and cow's milk—Cow's milk cannot always be digested.

Symptoms.—Two classes, according to cause—Food suitable but insufficient—Food unsuitable—Wasting—Constipation—Cause of inactivity of bowels—Flatulence—Colic—Ravenous appetite—Eruptions on skin, strophulus and urticaria—Thrush, its importance in prognosis—Inward fits—Attacks of vomiting and diarrhœa—Convulsions—Aphthæ—Danger of secondary diseases—Mode of death.

Treatment.—Suckling—By mother—By nurse—Rules for choosing nurse—Directions for efficient suckling—Advantages of putting child early to breast after birth—Times of suckling—Artificial feeding—Directions—Feeding-bottle—Importance of cleanliness—Different infants' foods—Liebig's food—Cow's milk may disagree—Weaning—Usual time—Must sometimes be anticipated—Method of weaning—Reason why a child may refûse the breast—Diet after weaning—General management of infants.—Treatment of—Constipation—Flatulence and colic—Convulsions—Thrush—Aphthæ—Diarrhœa and vomiting.

THIS is the commonest form of disease, and the most frequent cause of death in infants. Many thousand children die yearly in London alone for the simple reason that they are fed systematically and persistently upon food which they cannot digest. And so long as the children of the poor are allowed to leave their schools utterly uninformed as to duties which in after life they will be called upon to fulfil, so long this dreadful mortality may be expected to continue.

Causes.—The supply of food may be actually insufficient. This is found in cases where the child is nourished entirely by the breast, and the milk of the mother is poor and watery; or in those cases where the breast has remained the sole support of the child after the time when some other food ought to have been given in addition. When the mother is weak, anæmic, and evidently ill-nourished, her milk no doubt always suffers from the impoverished state of her blood; but the converse of this is not always the case for the milk of a woman may still be of very inferior quality, although in her health and general appearance she may present no sign of weakness. From the researches of MM. Vernois and Becquerel[1] we find that the richest milk is far from being secreted by women of the greatest muscular development. On the contrary, their investigations tend to show that a robust figure is inferior in milk-producing power to one slighter and less apparently vigorous. The following table, formed after an analysis of sixty-three cases of the former, and twenty-three of the latter, will make this apparent. Under the first head (strong constitution) they place brunettes, with well-developed muscles, fresh complexion, moderate plumpness, and all the other external signs of constitutional strength. Under the second head they range fair complexioned women, with light or red hair, flabby muscles, and sluggish muscular contraction.

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[1] "Du Lait chez la Femme." 8vo. Paris, 1853.

	Strong Constitution.	Weak constitution.	Normal.
Specific gravity .	1032.97	1031.90	1032.67
Water	911.19	887.59	889.08
Solid parts. . .	88.81	112.41	110.92
Sugar	32.55	42.88	43.64
Casein	28.98	39.21	39.24
Butter	25.96	28.78	26.66
Salts	1.32	1.54	1.38

It will thus be seen that in women ranked under the head of strong constitution the deficiency in the amount of the sugar and the casein is very remarkable, while in those of apparently weaker constitution these elements very nearly attain the normal standard.

There is another condition of the milk which appears to exercise a great influence upon the health of the nursling. Out of 89 infants suckled by women in apparently good condition fifteen were found by MM. Vernois and Becquerel to be inefficiently nourished. On a careful analysis of the milk it was found that in all these cases the relative proportion of the butter was raised considerably above the normal standard, being on an average 33.22, against 26.66, the healthy amount, while the proportions of the casein and the sugar remain unaltered.

For practical purposes, we may make a guess at the quantity and quality of the milk by inspection of the breasts of the mother or nurse. They should be pear-shaped, hardish, and mottled with blue-veins. On pressure of the gland the milk should squirt out. The milk itself should be opaque and of a dull white color; under the microscope it should present fat globules of medium size, not too small. As a rule, the number of the fat globules is a rough indication of the quantity of casein and sugar, although this, as has been said, is not always a trustworthy guide. The best test, however, of the goodness of the milk is derived from observation of the child. He should be watched while at the breast, and if he sucks vigorously, finishes the meal with the milk running over his lips, and requires suck but a few times in the day, we may infer that the milk is sufficiently abundant. If, on the other hand, he constantly requires the breast, sucks laboriously and with effort, occasionally desisting and crying peevishly, the milk is probably scanty. As an additional test the infant may be weighed immediately before and after taking the breast: the increase in weight should be from three to six ounces, according to his age.

Besides the above cases, where the *quantity* of the food is at fault, there is another class of cases where nutrition is equally unsatisfactory, although the supply of food, as food, is liberal enough. These cases occur where weaning is premature, or where the child has been brought up by hand, and the kind of food chosen to replace the natural nourishment is injudiciously selected, so that the limited digestive power of the child is unable to convert it into material necessary for the growth and development of the tissues. Here the diet substituted for the mother's milk, although nutritious enough in itself, yet supplies little nutriment to the infant. A child is not nourished in proportion to the bulk of the food he receives into his stomach. He is only nourished by the food he can digest. Weakness in a child otherwise healthy, while it shows a deficient degree of nutrition, and therefore calls for an increased supply of nourishment, yet at the same time calls for increased care in the selection of the *kind* of food. There is a difference between food and nourishment. A child may take large quantities of food into his stomach, and yet from weakness of his digestive organs, or from the indigestible nature of the food swallowed, may derive no nourishment from it whatever. On the contrary, it may cause great irritation and pain in the alimentary canal, and, setting up a febrile state, still further reduce the child whom it was intended to support. The tendency of mothers is to overfeed their children—to mistake every cry for the cry of hunger. Consequently, as the peevishness and irritability of the child increase in proportion to the pain excited in the bowels, the food is made more and more "nourishing;" the louder the cry the thicker the "sop," until at last a violent attack of vomiting or of diarrhœa takes place, or a convulsive fit warns the parent that it is time to desist. Cases of steady emaciation will be constantly found due to this cause, especially in children who are brought up by hand. Amongst the poorer classes they are commonly fed upon farinaceous food as soon as they are born. This, of course, they are totally unable to digest. As a consequence, they dwindle and rapidly die, or, if of particularly robust constitution, linger on, weak, ailing, and rickety, until an attack of bowel complaint, or other intercurrent disease, carries them off. The very fact that the secretion of saliva in the young child does not become established until the third month after birth, seems to indicate that before that age farinaceous articles of diet are unsuited to the infant, as saliva is one of the most potent agents in the digestion of starchy foods. Besides, for perfect nutrition four classes of foods are required—viz., albuminates, fatty substances, carbo-hydrates, and salts. These are found in the most digestible form and the most perfect proportions for the young child in the casein, butter, sugar, and salts of the human milk. The casein supplies the waste of the nitrogenous tissues, as the muscles, and probably the brain and nerves, and by its oxidation, when it has formed part of these tissues, contributes also to animal heat. The butter is essential to the formation of muscular and nervous tissues, and also aids by its oxidation in the production of heat. The sugar is probably entirely heat-giving. The salts form necessary constituents of all tissues.

In nutrition, it is important that tissue change should be rapid, and in young children, where development, as well as growth, is so brisk, this is of especial importance. It is effected by the oxidation of old material, which is then removed, to be replaced by new matter. For rapid change, therefore, it is indispensable that no needless impediment should exist to the free oxidation of the tissues. Now, starches, and sugars into which the starches are converted by digestion, have a greater affinity for oxygen than albuminates; they, therefore, tend to appropriate the oxygen which is required for the removal of waste matters, and so prevent the proper changes from taking place. For this reason alone, and without any reference to their indigestible properties, they form a very unsuitable diet for a young child.

Even those children who are fed entirely upon cow's milk are not free from danger. By referring to the table[1] we see that the specific gravity of cow's milk is higher than that of woman's milk, and that it contains a larger quantity of solid matters, owing principally to an increase in the amount of casein. On the other hand, the proportion of sugar is less than that found in human milk. In adapting it, therefore, as a substitute for the natural food of the child, it will be necessary to remedy these differences by dilution with water, and by the addition of a small quantity of sugar of milk. But this is not enough. There is another distinction between the two fluids which it is extremely important to take into consideration. On the addition of rennet, the casein of human milk coagulates into light, loose clots, formed by the aggregation

	Specific gravity.	Water.	Solids.	Sugar.	Casein.	Butter.	Salts.
Woman's milk,	1032.67	889.08	110.92	43.64	39.24	26.66	1.38
Cow's milk,	1033.38	864.06	135.94	38.03	55.15	36.12	6.64

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[1] Vernois and Becquerel, *loc. cit.*

of little flocculi, while that of cow's milk congeals into heavy, compact lumps. The same thing takes place in the stomach of the child, as is shown by producing vomiting in an infant directly after a meal by friction over the belly: the light, loose clots formed from human milk are then readily distinguishable from the dense masses of casein produced by coagulation of the milk of the cow. The difference in the digestibility of these two products is very evident. While the one is readily assimilated without any undue demand upon the digestive powers, the other tasks these powers to the utmost, and, unless a very moderate quantity has been taken, will undergo fermentation, and give rise to much flatulence, colic, and perhaps diarrhœa in its progress along the alimentary canal.

Children are, no doubt, frequently found to thrive upon this diet, their digestive power being equal to the demands made upon it. Others, however, and by far the larger proportion, are not equal to this daily call upon their powers. They cannot assimilate this mass of curd. Consequently, unless rejected by vomiting, it passes through them undigested; their wants are not supplied and they starve for lack of nourishment, although swallowing every day a quantity of milk which would be ample support to a much stronger and healthier infant. Such children are exceedingly restless and irritable. They cry day and night; at one time from abdominal pains excited by the presence in the bowels of this undigested mass; at others, from the hunger which the passage of this meal has failed to appease. The nurses say, very truly, that the "child is ravenous," and that "the milk does not satisfy him;" but the baked flour, the infant's biscuits, and the tops and bottoms by which they propose to themselves to attain that end, are by no means calculated to do so. Instead of mitigating his distress, they aggravate it; and every additional meal, although it may quiet him for the time, yet, by the discomfort which it is certain to produce, forms a subject for future complaints. It is, however, often very difficult to persuade mothers and nurses of the importance of what has been stated. They see that the child is wasting under the diet they have first adopted, and therefore will not but infer that something more solid must be required. It is necessary to impress upon them very strongly that a child may actually starve on the fullest diet, and that the presence of large quantities of farinaceous or caseous matters in the alimentary canal is not necessarily followed by any additional supply of nourishment to the tissues. In all cases where the food of an infant is said by nurses to be insufficient, the stools should be carefully examined, and if, as is so frequently the case, they are found to consist of pale, round, hardish lumps, exhibiting in their interior the cheesy appearance so characteristic of a mass of curd, we may safely conclude that it is not that too little is being given, but too much; and by taking the necessary precautions, we may succeed in providing the child with a diet he is capable of digesting.

Besides the weakness produced by the withholding of nourishment, there is an additional cause of debility in the constant attacks of vomiting and diarrhœa to which this indigestible diet invariably leads. Each of these attacks reduces him more and more, and by weakening his digestive power renders him less than ever able to obtain any nourishment from the food with which he is supplied.

Symptoms.—The symptoms of simple wasting from insufficient nourishment may be divided into two classes, according to the nature and quantity of the food taken:—

Food suitable, but insufficient.

Food unsuitable.

In the first of these classes there are no very striking symptoms. The infant gradually loses his plumpness; his fat slowly disappears; and the muscles get very flaccid and soft. He does not seem to grow. His face becomes pale, and his lips pale and thin. He is peevish as a consequence of his hunger; takes the breast ravenously at the first, and then, if the secretion of milk is scanty, desists at intervals to cry passionately as if in vexation at his inability to obtain the means of satisfying his wants. His skin is moist, and he perspires readily and copiously. The fontanelle is level or slightly depressed. At night he is exceedingly irritable and sleepless. In the daytime he will often lie quietly enough, holding both thumbs in his mouth, and sucking at them until the skin at the sides of the nail becomes raw and abraded. If the milk is poor but abundant, the child is usually very quiet and drowsy, passing almost all his time asleep. He may even sleep while at the breast—a sure sign that the milk is thin and serous. The bowels are usually confined, and the motions rather solid, although otherwise natural. No symptoms are found to indicate disease of any particular part of the body.

In this class of cases nutrition is defective on account of the inferior quality and insufficient quantity of the mother's milk, and nothing is added to compensate for these defects. The remedy is, of course, to supply the deficiency. When the required nourishment is given, the wasting stops at once, the peevishness ceases, and the child, rapidly regaining flesh, becomes strong and healthy.

In the second class of cases, where the food is bad in quality, we find the symptoms of defective nutrition combined with other symptoms produced by the irritation of the digestive organs to which the presence of indigestible food necessarily gives rise. The child is dull and languid, his flesh becomes flabby, and he begins to waste. The skin is moist, at the first, although afterwards it is apt to become dry, except about the head; and the fontanelle is, or soon becomes depressed. The face and body generally are pale, and the complexion sometimes turns yellowish, assuming a half-jaundiced tint, which remains several hours, or even days, and then disappears. The tongue is clean, pink, and moist, and remains so as long as there are no symptoms of acute digestive disturbance.

The bowels are irregular and capricious; constipation alternating with occasional attacks of diarrhœa. The common condition is constipation; a stool occurring every second day, consisting of hard, whitish lumps, covered with a stringy mucus, and formed almost entirely of indigested food. Its evacuation is often attended with much straining, and may be preceded by some pain in the belly. The cause of this sluggishness of the bowels is the presence of mucus secreted in unusual quantities on account of the irritation to which the membrane lining the alimentary canal is exposed. This mucus, being coagulated by the acid resulting from the decomposition of the starchy food, covers the contents of the bowels, and also forms a tenacious lining round the inner surface of the intestine. Consequently the bowels, in their peristaltic action, glide over the slippery surface of the masses of food, and lose their power of propelling these forwards towards the outlet. Sometimes, however, instead of being confined, the bowels are open three or four times a day, the stools being green, half-liquid, slimy, and extremely offensive. In either case the food which the child has taken passes through him without being digested.

Flatulence is a source of great annoyance to the infant. It may cause paroxysms of violent pain, in which the face becomes white, the upper lip livid and everted, and the belly tense. The child utters piercing cries, at the same time drawing up the lower limbs suddenly and violently upon the abdomen. Even during sleep frequent startings and moanings, elevation of the corners of the mouth, and, if the pain be severe, a contraction of the brows, show that the child is suffering from abdominal pains. The smile which is sometimes seen upon the child's face during sleep is a result of the same cause, although, of course, to a much less degree. The wind is often evacuated in large quantities, or comes up as sour-smelling eructations, affording great relief. The temper is exceedingly irritable. The pain and uneasiness from which these children suffer, and which is constantly being renewed by every additional meal, makes them noisy in their lamentations to a degree which is almost unbearable. As the mothers say, "they wear one's life out." At night this is especially the case. At that time they are apt to be feverish, and are often seized with fits of screaming which nothing will appease, and which sometimes continue until actual exhaustion compels them to desist. Even then, however, the cries are renewed at intervals, as a fresh attack of abdominal pain rouses them from uneasy sleep. At these times the feet are usually cold, although the belly, hands, and cheeks may be dry and hot.

But in spite of all this, or rather as a consequence of it, the appetite is usually enormous. The uneasiness produced by acidity and flatulence will often excite in children a great desire for food, and unless the uneasiness amounts to actual pain, they will swallow ravenously whatever is offered to them. The amount of farinaceous matter an infant will consume in this way is sometimes very large, and the fact that, in spite of such voracity, the child should still continue to waste, excites much wonder amongst his attendants.

Attacks of nettlerash and strophulus, either separately or combined, are very common. With the appearance of nettlerash every one is familiar. Strophulus may be either of the red or the white variety.

Red strophulus (red gum) begins as a red blotch, the centre of which is slightly elevated. The redness soon fades, and the central elevation enlarges and forms a flattened papule, often of considerable size. These are seated on the face, neck, arms, and sometimes cover the whole body.

White strophulus appears in the form of pearly white opaque papules, smaller than the preceding, and about the size of a small pin's-head. They are seen usually on the face and arms.

The presence of either of these eruptions (nettlerash or strophulus) on the body of a young child is a certain sign of digestive derangement.

Thrush (parasitic stomatitis) is another consequence of the unsuitable diet to which the child is exposed, and is especially common in warm weather. The mucous membrane of the mouth becomes red; then little concretions, transparent at first, afterwards pearly white, appear on the reddened surface, unite, and form patches varying in size, and looking like little bits of curd adhering to the tongue, and to the inside of the cheeks and lips. In very bad cases, they line the whole interior of the mouth, and may extend into the fauces, and even down the gullet. According to Trousseau, they are not developed on the interior of the stomach and bowels, being limited to parts of the mucous membrane which are covered with scaly epithelium. At the same time there is a little febrile disturbance, with some thirst; usually vomiting; and often a thin watery diarrhœa, from the irritation of deranged intestinal secretions. If, as frequently happens, the nates become red and excoriated by the discharges from the bowels, the thrush is said by nurses to have "gone through" the child. There is some tenderness of the mouth, and if the child be put to the breast in the course of this complaint, he often refuses to suck on account of the pain excited by the movements of the tongue and cheeks.

The concretions are due to a cryptogamic vegetation (oidium albicans), the sporules of which increase with great rapidity, and form tubular fibrils. These, with an increased formation of epithelial scales, constitute the white patches seen on the mucous membrane. The plant finds a nidus in the altered secretions of the mouth.

This is either a mild or a severe complication, according to the general condition of the child in whom it is found. If it occurs in a child who has been reduced to a state of great weakness by a long course of improper food, it is of very unfavourable augury, for in such a case our hopes of improving his health depend upon the rapidity and completeness with which new materials for nutrition can be introduced into his system. Anything, therefore, which tends to prevent the introduction of nourishment tends to deprive the child of this his only means of recovery, and the presence of thrush betrays a condition of the digestive passages extremely unfavourable to the ready assimilation of food. Besides, the diarrhœa which is so apt to accompany the disorder, especially in weakly children, is another reason for regarding the occurrence of this complication, in such cases, with considerable anxiety.

In stronger children, want of cleanliness, or temporary derangement set up by improper food, may give rise to thrush, but here, if the strength is satisfactory, recovery is usually rapid; the concretions become grayer, then yellow, fall off, and are not renewed.

Another symptom of the irritation excited by unsuitable food is that known in nurseries under the name of "inward fits." The phenomena which constitute the condition denoted by this rather vague expression, are a blueness or lividity of the upper lip, which is rather everted, and may twitch; a slight squint, or a peculiar rotation of the eye; with contraction of the fingers, and twisting inwards of the thumbs. These symptoms should never be disregarded, as they are often the precursors of an attack of convulsions.

If a great accumulation of food has taken place in the alimentary canal, or the child has swallowed some substance which is more than usually indigestible, or has been exposed to cold, the symptoms may become more alarming. The skin gets very hot, the face flushed, and there is violent vomiting of sour-smelling food, with mucus, preceded by great retching. The efforts to vomit may continue after the stomach has been evacuated, and then green or yellow bile is thrown up. At the same time the bowels become very loose, and large dark green, or putty-like, offensive motions are passed, with great straining. The motions often contain little lumps, and each action of the bowels is preceded by much griping, during which the child screams, draws up his legs, and throws himself uneasily from side to side. The tongue is rather dry, and is thickly coated, white or yellow, with large, round, red or pink papillæ scattered over its surface, peering through the fur. The belly is full, rather hard, and irregular to the feel. The child refuses all food, but is very thirsty; he usually, however, vomits the fluid he has taken very shortly after swallowing it. Sometimes a convulsive fit ushers in this attack, and may be repeated several times. Occasionally these fits recur in such numbers, and with such violence, as to cause death by the exhaustion they induce. The vomiting usually ceases after the first day, or is repeated at longer intervals, but the diarrhœa continues two or three days, unless treatment be quickly had recourse to, and the motions change their character, becoming watery, and usually of a brown colour, still remaining extremely offensive. If the straining be great there may be slight prolapse of the bowel, with a little blood in the form of red streaks in the motions.

In children over twelve months old, these attacks are often accompanied by aphthæ of the mouth. They are found on the tip of the tongue, round the anterior part of its margin, and on the inside of the lower lip. They consist of small circular superficial ulcers, seated at the follicles of the mucous membrane. According to MM. Rilliet and Barthez,[1] aphthæ begin as vesicles, the epithelium of the follicle being raised up by altered secretion in its interior. This bursts, and a small ulcer is the result. At the same time the lower gums are usually red, swollen, and shining; they easily bleed, and may be ulcerated along the roots of the incisor teeth. There is also increased secretion from the mucous membrane of the mouth, with some salivation. The number of the aphthæ varies from two or three to fifteen or even twenty. They are very rarely solitary; usually about five or six.

When the attack subsides, the infant, unless a better system of management be adopted, goes on as before, the wasting continues, and he becomes gradually weaker and more languid. The attacks of acute indigestion recur at short intervals, each, as it passes off, leaving him more prostrate, and less able to withstand the injurious influences which are gradually wearing away his life. His face becomes wrinkled and old-looking; his eyes dull and heavy; his expression languid, or peevish; and, as his debility increases, the griping pains to which he is still subject excite no longer a fretful cry, but only a plaintive moan, or merely a contraction of the features without any sound. His emaciation becomes extreme; his belly large; his skin harsh and dry; his fontanelle deeply depressed; and finally, some secondary disease arises, and puts an end to his existence. Any acute disease attacking a child in such a condition is almost certainly fatal, for all resisting power has been starved out of him, and he falls a ready victim to a disorder which, in a healthy child, would be easily manageable, and quickly cured. The least catarrh runs on to bronchitis or lobular pneumonia; the slightest chill may set up an uncontrollable diarrhœa; and it is to chronic diarrhœa that the final cause of death may be most usually attributed—a diarrhœa which may last weeks, or months, and there is matter for much astonishment in the length of time a child will linger on, although reduced apparently to nothing but skin and bone. If the child has been brought up entirely by hand, and has been fed improperly from his very birth, he seldom lives longer than three months. If he has been suckled for some months before the commencement of the improper food, he has greater power of resistance; and although under the new diet he will soon become dull, and pale, and flabby, yet the effects upon his flesh and strength are less noticeable, and he usually drifts into rickets before any appearances have been thought sufficiently serious to require medical interference.

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[1] Maladies des Enfants, tome i., 8vo. Paris, 1861.

Treatment.—The treatment of simple wasting from insufficient nourishment consists principally in so selecting the diet of the infant, with due regard to his age and capabilities, that he may be able to digest, and therefore to be nourished by, all the food he takes. To do this, we must be thoroughly acquainted with the scale of diet suited to a healthy child from his birth onwards; we are then able to vary this diet according to the digestive power we find in our patient. The weaker the child, the more nearly does his condition resemble that of a new-born infant in his power of assimilating different articles of food, and therefore the earlier in the scale must we look for the nutriment suited to his wants.

A short sketch of this subject will, then, not be out of place.

The child ought, if possible, to be suckled by his mother. Most mothers are able to perform this duty: all mothers ought to try; partly for their own sakes, as it insures uterine contraction, and prevents mammary abscesses; partly for the child's sake, as the milk of his own mother is, as a rule, better suited to him than that of a stranger. In cases where the choice lies between maternal suckling and artificial feeding, the mother ought to do everything in her power to avoid the latter alternative. "Every woman," says Stoll,[1] "who can bear a child, can suckle it, at least during the time she keeps her bed;" and even to be kept to the breast for this short time is an advantage to the infant by no means to be despised. If the mother be delicate and the secretion scanty, good diet, especially stout, will often cause a marked increase in the secretion of milk. On the other hand, if she has been over-stimulated by a too rich diet, diminishing the quantity of her food, and the administration of a gentle saline purgative, generally produces a plentiful supply of milk. Feverishness, from whatever cause, will necessarily tend to diminish the lacteal as well as the other secretions of the body; in such cases, therefore, increasing the quantity of food would have an effect the very opposite of that which it is desired to produce. If these measures fail, the breasts may be galvanized, as recommended by M. Bouchut.[2]

Should the mother, after repeated trials, prove unable to suckle, a wet-nurse must be provided. In choosing a nurse, attention should be paid to two points—viz., the state of her health, and the age of her milk. With regard to her health, she should be examined for signs of phthisis, scrofula, or syphilis; her breasts should be inspected, and we should endeavour to estimate the condition of her milk from its appearance, by the naked eye and by the microscope. The best test, however, is the condition of her child, who should always be examined. If he is healthy and thriving, the milk is in all probability in a satisfactory state. The age of the milk is a point of considerable importance, for the farther lactation is advanced, the more casein will the milk contain, and the richer will be its quality. It is, therefore, advisable that her confinement should have taken place at about the same time with that of the mother whose place she is to supply, otherwise the milk may be unsuited to her nursling. It is often necessary to change the nurse, for, as appears from the investigations of MM. Vernois and Becquerel, already quoted,[1] in the milk of some women the quantity of the oily constituent greatly predominates. In such cases the milk may not agree with the child. We must not rest until a nurse has been provided who is in every way fitted to make the infant strong and healthy.

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[1] Prælectiones in diversos Morbos Chronicos. Max. Stoll. Volumen ii. p. 114.

[2] Hygiène de la première Enfance. Paris, 1862.

The diet of the nurse should be liberal; a certain amount of fresh vegetables and fruit should be included in her meals, and she may take reasonable quantities of wine or beer.

Young mothers with a first child are sometimes awkward in the handling of their charge, and this is not unimportant. Infants held awkwardly to the breast often find a difficulty in retaining the nipple, and may refuse the breast and be very fretful on this account. The mother should not hold herself too erect, but should bend over the child so as to allow the nipple to fall easily into his mouth. The child should be placed partly on his side, and the mother should support the breast with the two first fingers of her unoccupied hand, so as to keep it steady while the child draws the milk. If the milk flows too quickly and abundantly, as sometimes happens, it may cause vomiting from the rapidity with which it has to be swallowed. In these cases she should be taught to press gently with the two fingers which hold the breast, so as to regulate the flow.[2]

The new-born infant should be put to the breast a few hours after birth; or as soon as the mother has recovered from the first fatigues of labour. This course has several advantages: it insures the proper contraction of the uterus, for when the child has once taken the breast, no danger from after hemorrhage is to be apprehended: the child has the benefit of the thin, watery colostrum which precedes the appearance of milk in the breast, and which acts as a gentle laxative upon the bowels, clearing out the meconium with which they are loaded; and the nipple is drawn out while the breast is still soft. If suckling is delayed until the secretion of milk has become regularly established, the breast is apt to be distended by its secretion, so as almost to hide the nipple. The child has then great difficulty in obtaining a hold of the nipple, and may besides suffer much pain from the pressure of his face against the hardened gland. No food of any kind should be given to the child at this time. The practice of giving butter and sugar, gruel, &c., to a new-born babe, is a mere cruelty, and must be strictly forbidden. The child should be put to the breast, as Dr. White[1] has observed, "whether there be signs of milk or not," and there is always more or less colostrum, which forms a sufficient nourishment until the supply of milk becomes confirmed. Whether the mother is afterwards to suckle her child or not, she should endeavour at any rate to do so for the first month, during which time a fitting nurse can be secured, if a wet-nurse is really required.

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[1] See page 27.

[1] Trousseau, Clinique Médicale, Leçon lxii.

The child should take the breast at regular intervals, every two hours during the day for the first six weeks, and he should suck from each breast alternately. At night it is important that the mother should be undisturbed; and besides, it is well to accustom the child to quiet during the hours of sleep. He should, therefore, be fed for the last time at 11 P. M., and be then put to rest in a cot in the nurse's room until five o'clock on the following morning, when he may again take the breast. By this means the mother is insured six hours' uninterrupted sleep. If, during the interval, he awakes and cries, he may be pacified by a little cow's milk and water; but it is wiser, at any rate after the first few weeks, to accustom him to take nothing between the hours mentioned, for children, like their elders, are creatures of habit. The infant soon becomes used to the plan, and will wake and sleep again with perfect content if he knows that his cries will be disregarded. After six weeks the interval between the meals should be increased to three hours or even longer if the child shows no desire for the breast. It is as great a mistake to urge an infant to take nourishment as it is to quiet him with the breast whenever he cries. The mother should be able to perceive when her child cries from hunger, and when from uneasiness or ill-temper. If the babe rouses himself and seems pleased at the sight of the mother, clenching his hands, and flexing his limbs, he is hungry. If he remains passive, he does not require the breast. If he cries peevishly, has a hot skin, and jerks his lower limbs uneasily about, he is troubled with indigestion, and the milk would increase his discomfort.

Up to the age of six months the breast must remain the child's sole nourishment, provided that the secretion of milk, and its quality, are found to be satisfactory. If not, and the child wastes, or does not grow, other food must be given in addition, as will be afterwards described.

If the mother cannot suckle her infant, and a wet-nurse cannot be provided, the child must be "brought up by hand," feeding from a bottle. Here the greatest care is requisite. The substitute for human milk should resemble that fluid as closely as possible, or by proper preparation should be made to do so. The milk of the ass approximates most nearly to woman's milk in the proportion of its several constituents, and forms a very good diet for infants, although, sometimes, it is found to have a slight purgative action upon the bowels. If this, however, cannot be procured, cow's milk is the one to which recourse is usually had, and this has at any rate the advantage of being always obtainable. Cow's milk, as has already been stated (see page 29), has a higher specific gravity, and contains more casein, but less sugar, than human milk. Dilution with water, and the addition of sugar, will readily remove these differences. The other, and greater, objection to this milk, viz., the firm clot formed by its casein when coagulated, can also be removed by the addition of an alkali. For this purpose carbonate of potash, in the proportion of one grain to each ounce, or lime-water, may be used, and of these the latter is usually preferred. Lime-water contains half a grain of lime to each fluidounce. For the first six weeks the milk must be diluted with an equal quantity of lime-water, and must be sweetened by adding to each six ounces as much sugar of milk[1] as will be taken up by the flat end of a teaspoon. To this Sir William Jenner[2] recommends the addition of a little cream, in the proportion of two teaspoonfuls to the half pint. The milk must not be boiled, but the cold mixture must be warmed by dipping the bottle containing it, for a few minutes, into hot water. After six weeks the quantity of lime-water may be diminished; one-third part being added to two-thirds of the milk; and after three months, the quantity may be still further reduced to one-fourth. After four or five months the cow's milk may be given pure. During all this time the quantity of sugar of milk, and of cream added, is to remain the same.

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[1] Treatise on the Management of Pregnant and Lying-in Women. By Charles White, M. D. 8vo. 2d ed., 1777.

The child must be fed at regular intervals, from three to four ounces being given every two hours for the first six weeks. The alkalinized and diluted milk should be put into a feeding-bottle, and the child be allowed to suck until its contents are exhausted. If before that time he seems satisfied, he should never be pressed to continue; the first show of indifference is a sure sign that he has had enough; and when the meal is concluded, the bottle should be at once removed. It is injurious for infants to suck at an empty vessel, as they thereby swallow air, which is afterwards a cause of great uneasiness. If any milk remains in the bottle at the end of a meal, it should by no means be laid aside and warmed for a subsequent meal, and only the quantity required for each particular repast should be prepared at one time, to avoid fermentation.

The best kind of bottle is the one known as "Maw's Feeding-Bottle." It consists of a glass bottle, closed by a metallic cap, from which a straight glass tube passes to the bottom of the vessel. This is connected in the cap with a second tube, of caoutchouc, to which is attached the mouth-piece. This apparatus must be kept perfectly clean, being washed out each time after being used, with water in which a little soda has been dissolved, taking care to clean inside the cap with a brush, and to force water through the caoutchouc tube. It must be then placed in a basin of cold water until again wanted. This is the only way of insuring perfect cleanliness, and unless it be done with great care, there will be a sour smell on removing the cap, showing that some milk has been left to ferment. Fresh milk added while this remains will turn sour in a few minutes. In choosing a bottle, it is better to select one the cap of which is not lined with cork. The cork lining takes up a certain quantity of the milk, which turns sour, and is with great difficulty removed. The better plan is to insure perfect fitting of the cap by winding a narrow strip of linen round the neck of the feeding-bottle. This can then be thrown away at the conclusion of the meal; it must on no account be used a second time.

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[1] Sugar of milk, or lump sugar pounded, should always be used for children. The ordinary brown sugars contain albuminous matters, which decompose, and set up a kind of fermentation. They are very apt, therefore, to disagree.

[2] Lectures on Rickets. Medical Times and Gazette, May 12, 1860. The cream is also useful in preventing the lime-water from causing constipation.

The quantity given to the infant must be carefully regulated. For the first two or three weeks, six or eight tablespoonfuls at each meal will be sufficient; this can be gradually increased as the child grows older.

When the child is six months old, it is time to give some other food in addition; tapioca, semola, arrowroot, or baked flour,[1] may be used, and will all answer the purpose. If the one which is first tried is found not to be well digested, it must be changed for another; the same food will not agree equally well with different children, and we should therefore try one preparation after another until we have found a food which is suited to the particular case. When none of these agree, Liebig's "Food for Infants" is extremely useful.[2] This food contains milk, wheaten flour, and malt, with a small quantity of bicarbonate of potash.[3] The object of the malt is to convert the starch into grape sugar, and thus to relieve the digestive organs of part of their labour.

Of these farinaceous foods one, or at most, two meals a day will be quite sufficient; simple milk being given at the other times, as before directed.

After the eighth month, a little thin mutton or chicken broth may be added, all grease having been carefully removed. This must be given as an independent meal, and not as an addition to his ordinary meals.

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[1] For a discussion of the various merits of different preparations, see an admirable article, entitled "Food for Babies," in the Medical Times and Gazette, for August 24, 1867.

[2] Liebig's food may be obtained by persons resident in London of "Liebig's Registered Concentrated Milk Company" (chief office, 16 Tichborne Street, Quadrant). It is prepared, in the liquid form, with milk; and is sent out fresh every day, and ready for use, for about sixpence a quart.

In a concentrated form, it is prepared by Mr. Van Abbott. It is made in a dry form by Messrs. Savory & Moore, and by Mr. Mellen. Spiking's Malt Biscuits, prepared on the same principle, are also very useful.

[3] See a pamphlet, entitled "Food for Infants," by Justus von Liebig, translated by Elise von Lersner-Ebersburg. James Walton, London, 1867.

With some infants, in spite of all possible precautions, cow's milk causes indigestion and flatulence. If this happens, the milk must be entirely dispensed with for a few days, and the child be fed upon veal broth, with, or without, a small quantity of arrowroot, according to his age, or, if he be very young, the broth may be mixed with an equal part of barley-water. After a few days of this diet the milk may be returned to, and will often then be borne. If not, it must be again discontinued. Such children will often do well upon Liebig's food mixed with milk, although the milk by itself causes derangement. We should be careful in these cases to satisfy ourselves that it is really the milk which is at fault, and not its method of preparation, or the way in which it is given. Too large a quantity may have been given at once, or the meals may have been too frequently repeated, or, as so constantly happens, the whole secret may lie in a want of cleanliness of the feeding apparatus. Amongst the poorer classes, so common is this fault, that it is really the exception to find a perfectly clean feeding-bottle, and a large proportion of the deaths amongst their children may be traced to this carelessness alone. Even amongst the wealthier classes, in cases where the direction of the child's meals is left entirely to servants, the necessary cleanliness is not so common as could be wished. The first care of a medical man, when called to a child brought up by hand, should be to send for the feeding-bottle, and to satisfy himself by sense of smell that it is fit for use.

The above description of the method of bringing up a child by hand is also applicable to cases where the child is being suckled on impoverished milk. In such cases the breast should be given only twice a day, his feeding at other times being conducted according to the rules laid down.

The time of weaning is very important. Premature weaning is not without its dangers, but when deferred too long it is a fruitful source of evil. In ordinary cases, where the child is healthy, and the strength of the mother is sufficient for the task, twelve months should be allowed to elapse before the child is weaned. A longer continuance of suckling would make too great a demand upon the strength of the mother, and would be of no advantage to the child, who has by this time become well accustomed to other food. It is sometimes stated, particularly by French authors, that the time of weaning should be regulated by the progress of dentition ; that the child should not be deprived of the breast until the period has passed during which the accidents attendant upon dentition may be expected, which time they fix at the evolution of the canine teeth. This, however, is not a very safe guide, as rickets, a common result of mal-nutrition, may postpone indefinitely the evolution of the teeth. In these cases, to continue the suckling would be to encourage the very evil which it is our principal object to prevent. The existence of chronic disease in an infant reared entirely by the breast, so far from being an impediment to weaning is, on the contrary, the very strongest argument in favour of a change of diet; and the common objection of mothers that, on account of the child's weakness, they "dare not wean him," is the very worst objection that could be possibly urged, and is a sufficient proof that the suckling has already been continued far too long. Human milk is the best food for infants, not on account of any specific property it possesses, but merely because it is the most digestible. When, however, it is so poor as to be no longer nutritious, it ceases to rank as food; and by pursuing this course, we fill the child's stomach with a fluid which is incapable of nourishing him, but which, by satisfying his appetite for the moment, prevents his taking a meal which would be really beneficial.

In every case we must attend, not to popular prejudice, but to the actual condition of the child. Wasting, in a non-syphilitic infant shows the necessity for some change in the diet. But this change does not, unless the child is twelve months old, consist necessarily in weaning. His condition may be owing to a too liberal, or a too scanty supply of food, and we must make him depend more upon the breast-milk, or less upon the source of nourishment, according as to which of these two causes a history of his previous diet leads us to attribute his disease.

In giving additional food to children at the breast, a difficulty often arises from the repugnance of the child himself to this mode of feeding. Many children, particularly those who have been suckled too frequently, and to whom the breast has been offered as a means of quieting their cries, greatly prefer this way of taking nourishment to any other, and indeed continually refuse it in any other form. In these cases, should the mother's milk be poor in quality (which it often is, although very abundant) it is better, if all other means fail, to wean the child suddenly, as this offers the only plan by which he can be efficiently nourished. This course however, should only be resorted to when, in spite of great perseverance, we have not succeeded in attaining our object. A little judicious starvation will often do much.

Although, if circumstances allow it, the child should be suckled for twelve months, yet it may be necessary to wean him at an earlier period, thus—

If the mother's health suffers from nursing;

If from some cause, as pregnancy, or the occurrence of acute disease, her milk is rendered unwholesome to the child;

If the child is insufficiently nourished upon the breast-milk, and yet refuses to take additional food.

In all these cases the ordinary time of weaning must be anticipated.

A moment should be chosen for weaning when the child is not feverish, nor suffering pain from the actual cutting of a tooth. It is best to wean him gradually, lessening by degrees the number of the times he is allowed to take the breast, and continuing, for about a week, still to give it to him once a day; after which this too must be stopped. If the child has been fed as directed, there is very little difficulty about weaning; he may be fretful for a few days, and even refuse his food, but by perseverance he becomes reconciled to his loss.

Children sometimes wean themselves, seeming suddenly to take a dislike to the breast, although they are quite healthy and are apparently thriving upon the milk. This, however, may be sometimes occasioned by scantiness of the milk. Usually, when children refuse the breast, some cause can be discovered by which the process of sucking is rendered difficult or painful. Thus—

Retraction of the nipple may make it impossible for the child to obtain any milk until the nipple has been drawn out by a stronger child, by a cupping-glass, or by the mouth of the nurse.

Colic, or flatulence, when severe, prevents the child from sucking until the pain has subsided. In milder cases of abdominal discomfort, infants are, however, often particularly ravenous, as before explained.

Thrush, or aphthæ of the mouth, may have the same effect. Here the pain caused by the movements of the mouth during the act of sucking is the reason of the refusal.

Closure of the nares from syphilitic swelling and incrustation, or from measles, obliges the child to breathe entirely through the mouth. Here, whenever he attempts to take the breast, a sense of suffocation compels him to abandon the nipple.

In bronchitis, pneumonia, and broncho-pneumonia, the child sometimes refuses the breast; for there is laborious respiration, and both nose and mouth are wanted for air-passages.

In tongue-tie[1] and cleft palate, there is a mechanical obstacle to sucking, in the impossibility of producing the necessary vacuum in the mouth. The latter is an insurmountable difficulty, and necessitates artificial feeding. The former is readily cured.

When the child has become accustomed to do without the breast-milk, he may begin to take the food which is hereafter to form his ordinary diet. Potatoes carefully mashed with a spoon, with gravy; light puddings; eggs very lightly boiled; or a bone to suck, may be allowed. No meat, however, should be given till the sixteenth or eighteenth month, when he may begin with a very small quantity once in the day. The best kind is a small piece of roast mutton, without any fat or grease. This should be very finely minced, or even pounded in a mortar to insure fine division, for a young child will not chew his food. With this he may drink plain-water, toast-water, or milk-and-water.

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[1] By "tongue-tie" is here meant those cases where the frænum is attached to the whole under surface of the tongue as far as the tip. Such cases are exceedingly rare. The ordinary cases of so-called tongue-tie present no real obstacle to sucking, and need not be interfered with.

In making the different changes in the diet, it is important to watch the child carefully, so that too great precipitancy may be avoided. Any signs of laboured digestion should be carefully noted, and a simpler diet at once returned to. The child when awake should be active and cheerful, and his sleep should be tranquil and undisturbed.

While attention is thus paid to diet, all the other precautions, indispensable to perfect health, should be observed.

The greatest cleanliness must be maintained. Every morning the whole body should be well washed with soap and warm water, and should be bathed every evening with tepid water before he is put to bed. After each bath the body and limbs should be gently rubbed with the hand. The younger the child the warmer should be the water employed. At first the temperature should be about 90° Fahr., but after a few months it may be gradually used cooler, although it should never be lower than 60 Fahr. Soap is required to thoroughly remove the tenacious cutaneous secretions and the dirt. The use of soap is said by some writers to make the skin too dry, and subject to cracks, but if frictions are used after each bath, this objection is removed, as the skin is thus excited gently to act, and remains sufficiently lubricated. His napkins should be changed sufficiently often, and the nates after each action of the bowels should be well sponged with warm water, and carefully dried. He should sleep by himself in a little cot, without curtains; not in the same bed with his nurse. The nurseries should be large and well ventilated, but not too hot, especially at night. They should face the south, if possible, as sunlight is of great importance. He should be taken out frequently into the air, whenever the weather permits. His out-door dress should be warm, and as a further protection against the cold, he should wear a flannel bandage round the belly.

From the sketch given in the preceding pages of the scale of diet suited to a healthy child, it is easy so to arrange the number and quality of his meals that a sufficient amount of nourishment may be given without overtasking his digestive powers. When the diet has been properly regulated, the child is found rapidly to regain flesh, his peevishness and irritability disappear, and his health returns. Any digestive derangement which may occur should be at once attended to, and as this is usually due to some deviation from the prescribed rules, a return to the proper diet will generally cause it quickly to disappear, especially if a gentle laxative be given at the same time. The constipation, which is so common a result of the improper food, often continues after the change of diet. In these cases, if the child be at the breast, the mother should take an occasional saline aperient, and should increase the quantity of fresh vegetables to her meals. Should this plan be insufficient, a teaspoonful of castor oil may be given to the child; or a few grains of magnesia with syrup of ginger, in some aromatic water, may be administered; or a little manna in a teaspoonful of infusion of senna. If, after repeated attempts, we find that a daily action of the bowels cannot be obtained without a daily repetition of the aperient, the constipated condition of the bowels may be natural to the child. We should, therefore, wait to see if his health or temper suffers from his costive habit. Should we find that acidity, with flatulence or colic, results from his constipation, we must continue our efforts to remove this tendency. When it is thus necessary to continue the laxative from day to day, Dr. Underwood[1] recommends a cold infusion of senna to be combined with some bitter tonic, as the infus. gentianæ co. This may be given in increasing doses until the torpor of the bowels is overcome; or a small piece of castile soap, introduced as a suppository, will have the same effect.

Daily frictions over the belly with the hand, or with some stimulating liniment, are also very useful in promoting a daily evacuation. Dr. Merriman[2] suggests the addition of aloes to the liniment:—

℞.—Tinct. aloes co., ℥ss;
Linim. saponis co., ℥j. M. ft. linimentum.

This should be rubbed into the belly every morning. If the child is twelve months old, aloes given by the mouth is warmly advocated by Dr. Dunglison.[3] A drachm of the powdered socotrine aloes should be dissolved in an ounce of simple syrup; of this one teaspoonful may be given, and may be repeated, if necessary, until a satisfactory stool is obtained.

Enemata are often very serviceable, administered either alone, or as an aid to the action of purgatives taken by the mouth. Two or three drachms of castor oil, with four ounces of thin, warm gruel, may be used for a child of twelve months old; or ten to twenty grains of socotrine aloes, dissolved in four ounces of boiled milk, may be administered to a child of the same age. In using these injections, the tube must be well oiled, and must be very carefully introduced, remembering that the bowel inclines gradually to the left side. The fluid should be thrown up with moderate force.

In children who suffer from habitual constipation, care should be taken to keep the feet perfectly warm. A warm bath will often produce an action of the bowels when aperients have been given without any effect.

Rhubarb should not be used as a purgative for constipation in children, unless combined with jalap or scammony, or some other purgative, on account of its after astringent effects; but for the same reason it is extremely valuable in the looseness of the bowels which is the result of acidity. Acidity is produced by fermentation of the food in the alimentary canal, and gives rise to much flatulence, shown by sour-smelling eructations and griping pains in the belly. In these cases the feeding apparatus should always be examined. A want of cleanliness in the bottle is a common cause of this teasing derangement. If the griping is accompanied by constipation, the bowels should be opened by a gentle purge, as magnesia and senna, or castor oil, after which the following mixture may be ordered:—

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[1] Treatise on the Diseases of Children. Edited, with additions, by Henry Davies, M. D. London, 1846, tenth edition.

[2] Underwood, p. 192.

[3] Commentaries on Diseases of the Stomach and Bowels of Children. By Robley Dunglison, M. D. London, 1824.

℞.—Sodæ bicarb., ʒj;
Æther chlor.,
Tinct. myrrhæ, āā ʒss;
Aq. menth. pip. ad ℥ij.
M. ʒj sextâ quâque horâ.

Aromatics are very useful in these cases, and indeed should always be included in mixtures for children wherever there are any signs of intestinal irritation. If the bowels, instead of being confined, are rather loose, with dark, slimy, offensive stools, a dose of powdered rhubarb and magnesia, five grains of each, should be given, and may be followed by the above mixture, with the addition of half a drop of laudanum to each dose, or the following[1] may be given:—

℞.—Tinct. opii, ♏viij;
Ol. ricini, ʒj;
Syrupi zingib.,
Mucilag. acaciæ, āā ℥j.—M. ʒj ter die.

If there is a sour smell from the breath, a few grains of prepared chalk may be substituted in each dose for the castor oil. At the same time all farinaceous foods should be suspended for a day or two, and the diet be limited to milk and lime-water, or plain milk. In all these cases of abdominal pain the feet should be examined, for cold feet alone may be the cause of the griping; should such be the case, on warming them the manifestations of pain will cease.

If a return to the ordinary diet is followed by the same flatulent condition, and this happens several times in succession, the food evidently does not agree with the child, and some alteration is required. Trials should be made of different kinds of foods, for, as already explained, the same food is not suited to every case. Liebig's food is a great resource under such circumstances. Sometimes it is the milk which disagrees, and we are forced to discontinue it altogether, giving instead beef, veal, or mutton broth, thickened with some farinaceous food. When the flatulence is thus obstinate, frictions with a stimulating liniment should be employed daily to the belly, the flannel bandage being removed for the purpose, and afterwards replaced. At the same time a mixture containing infusion of rhubarb, with a little tincture of myrrh, may be given twice or three times in the day, to give tone to the bowels, and increase their peristaltic action:—

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[1] In the screaming fits, accompanied by constipation, this combination of castor oil with laudanum is exceedingly valuable.

℞.—Infusi rhæi, ℥j;
Syrupi zingib., ℥ss;
Tinct. myrrhæ, ʒss;
Aq. menth. pip., ad ℥iij.—M.
ʒij bis vel ter die.

If sickness accompanies the flatulence, a teaspoonful of ipecacuanha wine should be given to relieve the stomach; after which a mixture containing bismuth and magnesia may be ordered:—

℞.—Bismuthi nitratis, ʒss;
Magnesiæ carb., ℈ij;
Syrupi zingib., ℥ss;
Mucilag. tragacanth, ℥ss;
Aquæ ad ℥ij.—M. ʒj ter die.

Or the mixture containing bicarbonate of soda with chloric ether and tincture of myrrh (see p. 46) may be used.

When the colic is very severe, great alarm may be excited by the state of apparent collapse into which the infant is thrown. The child should be placed in a warm bath; the bowels should be relieved by an injection of warm water; and a few drops of brandy or sal volatile should be given in milk or water. On being removed from the bath, the child must be carefully dried; a hot linseed-meal poultice, on which ten or fifteen drops of laudanum have been sprinkled, should be applied to the belly; and he should be then wrapped up in warm flannel. If the fontanelle remains depressed, the brandy may be repeated, and a mixture containing chloric ether with an alkali may be prescribed:—

℞.—Sodæ bicarb., ℈ij;
Æther chlor., ʒss;
Sp. ammon. aromat., ʒss;
Aq. anethi ad ℥ij.—M. ʒij tertiâ quâque horâ.

Convulsions may arise from this condition of the bowels, and must be treated in the same way. If, however, they continue, and are not relieved by the measures adopted, Dr. Graves[1] recommends turpentine to be given:—

℞.—Ol. terebinthinæ, ʒj;
Ol. ricini, ʒiv;
Mist. acaciæ,
Aq. cinnamomi, āā ℥iij.—M. ʒj tertiâ quâque horâ.

This acts on the bowels and produces a copious discharge of urine. On recovery, great attention should be paid to the diet and bowels, that the symptoms may not return.

Thrush is readily cured by attention to cleanliness. It should be made a rule always to wash out the child's mouth immediately after a meal, to prevent any accumulation of food or milk round the gums. This is readily done with a good-sized camel's hair brush, or a piece of linen rag dipped into warm water. Attention to this point will prevent the appearance of thrush, especially if care be taken that the nipple of the mother is perfectly clean. When thrush has appeared, the bowels should be cleared out with a gentle aperient, and the mouth, after being cleansed with warm water, should be brushed over with a solution of borax in glycerine (half a drachm to the ounce), or with a solution of hyposulphite of soda. By these means the parasite is readily destroyed.

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[1] Graves' Clinical Medicine. Edited by Dr. Neligan.

If aphthæ form, the same attention should be paid to cleanliness; a powder of rhubarb and jalap, with a grain of hydrargyrum cum cretâ should be given to evacuate the bowels; after which the following mixture should be prescribed :—

℞.—Potas. chloratis, ℈ij ;
Syrupi simpl., ℥ss ;
Aquæ ad ℥iij.—M. ʒij quartâ quâque horâ.

This must not be diluted, as it is important that the solution of chlorate of potash should be tolerably strong. When attacks of acute indigestion come on, with hot skin, furred tongue, thirst, vomiting, and diarrhœa, accompanied by griping pain, all food must be stopped, and nothing allowed but cold barley-water. The stomach should be relieved by an emetic of ipecacuanha, after the action of which a purgative of rhubarb and magnesia should be given to clear out irritating matters from the bowels. A mixture of chalk and catechu with aromatic confection can then be given, or the following :—

℞.—Bismuthi nitratis, ℈j ;
Pulv. cretæ aromat., ʒj ;
Syrupi, ℥ss ;
Mucilag. tragacanth., ℥ss ;
Aquæ ad ℥iij.—M. ʒij ter die.

If the diarrhœa continues after the tongue has become clean, half a drop of laudanum can be added to each dose of either of these mixtures, or small doses of sulphuric acid may be given with opium :—

℞.—Acidi sulphurici aromat., ʒss ;
Tinct. opii, ♏vj ;
Syrupi, ℥ss ;
Aquæ carui, ad ℥iij.—M. ʒij ter die.

When the irritability of the stomach has subsided, milk and lime-water may be given, but with caution, lest the vomiting return; and, after subsidence of the fever, great prudence should be exercised in recommencing the ordinary diet.

CHAPTER II.

CHRONIC DIARRHŒA.

ONIC DIARRHŒA.—May be secondary to acute disease—Or primary—When primary—Mode of commencement—Increased peristaltic action of bowels—When disease established—Character of the stools—Other symptoms—Complications—Serous effusions—Pneumonia—Exanthemata—Convulsions, uncommon, except towards beginning—Thrombosis of cerebral sinuses—Death without complication—Diarrhœa may cease before death—Influence of the disease upon dentition.

Causes.—In infants—Bad hygiene—Cold—Previous acute disease.—In older children—Worms—Tubercular disease of bowels.

Anatomical Characters.—Non-tubercular—Tubercular.

Diagnosis.—Between simple and tuberculous form.

Prognosis.—Signs—Favourable—Unfavourable.

Prevention.—Attention to diet—Avoidance of cold—Influence of dentition.

Treatment.—Diet and general management—External applications—Internal remedies—Antacids—Astringents—Enemata—Opium—Nitrate of silver—Raw-meat plan—Tonics.

CHRONIC DIARRHŒA may either occur as the sequel of an acute attack, or may begin insidiously.

In the former case it is often secondary to some acute disease, as measles or scarlatina. Here there is, in addition to the diarrhœa, fever, though perhaps of slight intensity, abdominal pains, languor, loss of appetite, and, very frequently, vomiting. This attack may subside for a time, but recurs again and again, until the chronic disease becomes established.

When chronic from the first, fever is absent. The stools are scanty and rare; usualy pale, often the colour of putty; not very liquid; and are evacuated with much straining and pain. At this stage the disease seems to consist merely in increased peristaltic action of the intestines forcing along their contents too rapidly to allow of efficient digestion being performed. The motions consist of curds and farinaceous matter, from the milk and food which has been swallowed, mixed with some half-liquid feces, and, if there be much straining, with mucus and blood. The blood at this time is in the form of red streaks, and results from the rupture of small vessels about the anus in the act of straining. In such a form it is a common accompaniment of diarrhœa in children where there is much tenesmus. The stools have often an offensive sour smell. The child looks rather dull and pale, but is still tolerably lively, and takes his food with appetite.

This state of things may continue for a considerable time, often for several weeks. The child gradually loses flesh, and becomes paler, and more languid; but there is no actual diarrhœa. He is exceedingly fretful and uneasy from the griping and flatulence; but there is nothing to excite alarm. The nurses on being questioned, will say that the bowels are "nicely open," and it often requires careful cross-examination of the attendants to discover the cause of the loss of flesh. In these cases, therefore, it is important to inspect the evacuations.

After a time the stools become more frequent and more liquid; but vary considerably in appearance from day to day. At one time, they are thin, watery, and brownish, like dirty water; at others, thicker, and clay-coloured, like thin mud; they frequently contain mucus, free, or mixed with a grumous matter, when they are called "slimy" by nurses, and almost always present little masses of undigested food. Occasionally they contain particles of grass-green matter, from altered blood, an indication of some additional irritation of the bowel. The smell becomes more putrid, and is often exceedingly offensive.

When the diarrhœa is regularly established, the tendency of the stools is to become more and more liquid, and less and less homogeneous; but there is no regular progression from bad to worse. There are alternations of improvement and relapse: sometimes the disease is better for a day or two, and may even seem almost cured; a relapse then takes place, and the condition of the child is as bad as before. These variations in the intensity of the diarrhœa will often be found, in the earlier periods of the disease, to coincide with variations in the temperature and humidity of the air. A damp, chilly day, is usually accompanied by increased severity of the symptoms, while on a bright, clear, warm day the disease is better.

The child begins early to waste; but unless the evacuations are very copious, the emaciation does not progress very rapidly. He gets pale, and, after a time, of a peculiar earthy tint which is very characteristic. The skin is dry and harsh, the eyes are hollow, the lips pale and thin, and the fontanelle is depressed. His strength diminishes, and as the disease advances he seems to lose all power of supporting himself, and lies like a log in his cot, or on his nurse's lap. Still, the appetite is usually preserved, and he will often take food eagerly whenever it is offered; but each meal is followed by a notable increase in the diarrhœa. His food, as the nurses say, seems "to pass through him directly it is swallowed." The tongue is moist, often quite natural, although sometimes the papillæ at the edges and tip appear unusually red and prominent. The belly may be quite flaccid and soft, but often becomes swollen and tense from gas generated by the fermenting food. At these times there is some pain, shown by plaintive cries, by uneasy movements of the legs, and by elevation of the corners of the mouth. Tenderness may also be present, but until the disease is far advanced is usually inconsiderable.

If the diarrhœa continues, the wasting becomes more and more marked; the bones project; the cheeks get hollow; the forehead becomes wrinkled; and the aspect generally is that of a little, infirm old man. The wrinkling of the forehead is due to loss of elasticity of the skin, which retains the folds into which it is drawn. The buttocks and inner part of the thighs become red from eczema occasioned by the irritation of the urine and fecal discharges. The appetite at this stage may be preserved, or even increased; but more often it becomes capricious, and the child, refusing milk and sop, craves for beer, or for the more tasty articles of diet which he sees eaten around him. Sometimes, however, he refuses to take any nourishment whatever.

The stools are now excessively frequent, ten, fifteen, twenty, or even more, in the four-and-twenty hours; there is often very great straining with each evacuation, and the bowel may even prolapse. The motions often look like chopped spinach in a dirty-brown, stinking water, and may contain blood—not in bright red streaks as at the first, but of a dirty, brownish-yellow color, and mixed with mucus and pus. When this occurs, and there is at the same time great tenderness of the belly on pressure, with gurgling, the bowel is probably ulcerated.

There are certain complications liable to occur in this disease which often hasten the end.

Serous effusions may take place on account of the poverty of the blood, and the relaxed, attenuated, state of the coats of the vessels. They begin usually at the feet, which hang down as the child lies in his nurse's lap. The instep gets quite round, and feels doughy; the skin over it is thin, and looks almost transparent; the contrast thus presented between the thin wasted leg and the bulbous foot is very striking and peculiar. The backs of the hands and the fingers then become swollen, and occasionally the face and eyelids are also œdematous. Effusions may also take place into the serous cavities, the pleura, peritoneum, and pericardium.

Hypostatic congestion of the lungs is very liable to occur, for, as the child lies constantly upon his back, stasis of the blood takes place in the most depending parts of his lungs. Death is not at all uncommon from this cause. For the same reason, *pneumonia* is not an unfrequent complication, and, if the child is very much reduced, may exist without producing cough, or any of the other symptoms by which its presence is usually manifested.

The exanthemata are very apt to attack children the subjects of this disorder, either from the diminished resisting power of the system induced by the debility, or from such a condition as obtains in chronic diarrhœa being especially favourable to the absorption of miasmatic poisons.

Convulsions may carry off the child early in the disease. They are not, however, commonly seen in the later stages. Convulsions are very common in children in whom there is a sudden depression of the vital powers, and are therefore frequently seen in acute diarrhœa, where there is a great and rapid drain upon the system. In these cases, however, where the debility is produced more gradually, although a greater degree of prostration may be reached, convulsions are rare, for the child then assumes some of the physiological characters of old age, and is much less liable to be affected by reflex stimuli.

Thrombosis of the cerebral sinuses may be a cause of death. In these cases, the child dies with symptoms of suffocation, or falls into a state of stupor, with dilated pupils, occasional strabismus, contraction of the muscles of the nape of the neck, fulness of one or both jugular veins, and sometimes paralysis of the facial nerve on one side of the face.

Some interesting cases of this complication are given by Dr. Von Dusch, in his paper on this subject.[1] On post-mortem examination clots are found in one of the sinuses—usually the longitudinal—plugging its channel. These clots are more or less discoloured, may be laminated in structure, completely fill the sinus, and adhere more or less firmly to its walls. The veins opening into the obstructed sinus are distended with blood.

The cause of the plugging is thus explained. The profuse watery discharge from the bowel produces inspissation of the blood at the same time that it diminishes its quantity. Absorption of water then takes place from the substance of the brain, decreasing its volume. As a consequence, the fontanelle sinks in, and the bones at the sutures overlap from the pressure of the atmosphere endeavouring to fill up the resulting space. If this is not enough to compensate for the lessened volume in the interior of the skull, the vessels of the brain and the sinuses become distended with blood. Now the rapidity of the current of blood in the sinuses is, even in a healthy state of the body, comparatively slight; partly on account of the dilatations in their calibre, and the projecting partitions in their walls; partly on account of the increased friction between the blood and the sides of the channel, caused by the angular form of the sinuses. If, then, this natural sluggishness of the current is increased by the diminution in the general mass of blood, and its inspissation—which result from the diarrhœa, and also by the weakened force of the heart's action—which is a consequence of the debility, we have a condition set up which is particularly favourable to the occurrence of thrombosis in these sinuses.

That the clotting of the blood is not a post-mortem change is shown by the colour, or rather want of colour, of the plug, by its laminated structure, and by the fact of its completely filling, and being adherent to, the sides of the sinus. That it is not due to inflammation is shown by the absence of all traces of inflammation in the wall around it.

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[1] New Sydenham Society. 1861.

When the disease terminates fatally, the child often dies from one of the above causes. Sometimes, however, he sinks and dies without our being able to say that any of these complications are present. In these cases the emaciation becomes extreme. The eyes, deeply sunken in their sockets, have a dull, ghastly look; the cheek-bones project; the cheeks sink in; the nose looks sharpened; a furrow passes on each side from the upper part of the ala of the nose, and forms a rough semicircle round the corners of the mouth; the lips are red, cracked, and covered with sordes; and the inside of the cheek and lips, and the surface of the tongue, become aphthous, or are covered with thrush. The tongue becomes dry, and, when free from thrush, is apt to have a granular appearance from projecting papillæ. The complexion is dull and earthy-looking, and the skin seems tightened over the projecting bones of the face. The fontanelle is deeply depressed. The body generally appears to consist of little more than the bones covered by the dry, rough, flaccid skin; each rib stands out sharp and distinct on the wasted chest. The belly may be flaccid, but more usually is full and prominent, as the emaciated and relaxed walls yield before the pressure of the flatus in the bowels. The skin of the abdomen becomes of a dirty-brown color, or is speckled with brownish spots. The feet and hands are cold, and often look purple even when not actually cold to the touch. The child lies quiet, with eyes half closed and dim. Occasionally he draws up the corners of his lips, and wrinkles his brow as if to cry, but makes no sound; but for this plaintive sign, and for his slow, quiet breathing, he might be thought to be dead. In these cases, death takes place almost without a struggle, and it is often difficult to say at what precise moment the child ceases to exist.

Sometimes for a few days before death the evacuations entirely cease, but no false hopes should be raised by this change, if a corresponding amendment does not take place in the general symptoms.

In cases of recovery, the stools gradually become more homogeneous, more solid, and more fecal, and one great sign of improvement is the reappearance of bile in the stools. The child at the same time becomes less torpid; his eyes grow brighter; he grows intensely fretful, and manifests his uneasiness by crying. The reappearance of tears is a very favourable symptom, and one which allows us to entertain strong expectations of his ultimate recovery. He ceases to emaciate, and soon begins to regain flesh—very slowly at the first, and the earliest advance in this respect is seen about the buttocks, which will be noticed to have become a little fuller and more rounded. The stools gradually lose their fetid character, get more healthy-looking, and constipation usually replaces the previous purging.

Although the nutrition of the body is so much interfered with in this disease, and the child daily emaciates more and more, yet it is exceedingly curious to find how in certain cases—usually the less severe ones—the growth and development of the teeth may continue in spite of the general condition. In the cases in which this occurs the teeth are for the most part cut easily, and without any apparent aggravation of the other symptoms. Nor does the eruption of each tooth appear to be accompanied by any special improvement which can be attributed to that as its cause. Dentition goes on rapidly and easily, while the diarrhœa remains stationary, or slowly improves. These cases generally recover. In an infant of eight months old whom I attended for this complaint, five incisor teeth made their appearance in the course of a month. The child got well. From this consideration we may conclude that the common idea which associates this disease with dentition, as a result of the cutting of the teeth, is one entirely without foundation. Dr. Cheyne,[1] who first described this disorder, under the name of atrophia lactantium, or the weaning brash, also takes this view. He states that this disease is often seen in cases where there is no swelling or inflammation of the gums, no salivation or any appearance of pain or tenderness about the mouth, in cases where the child is cutting his teeth easily, and even in children of three months old, who have no teeth at all. We shall see that it may begin almost at birth.

Causes.—Chronic diarrhœa may usually be traced to three different sets of causes, viz., bad hygienic conditions, impressions of cold, and the occurrence of some previous acute disease.

The disorder is very apt to attack children who are exposed to bad hygienic conditions, and the younger the infant at the time when these injurious influences are at work, the more liable is he to suffer from their effects in this particular way.

Improper food has already been strongly insisted on as a cause of defective nutrition in the child, and by the weakness which it invariably induces would alone render him less able to resist any other pernicious agencies to which he might be exposed. But in addition, the continued passage along the bowels of masses of indigestible food must cause constantly renewed irritation to his delicate mucous membrane, and, if the same diet be persisted in, must lead in time to diarrhœa. When due to this cause, there are three periods at which the disease is most usually found to manifest itself.

If the child be brought up by hand he may be subject to it from his very birth. In these cases the infant not only does not grow, but, as his fat gradually disappears, he seems even to become smaller and more puny. It is not uncommon for a mother to say, speaking of a child of two or three months old, who all his short life has been suffering from this complaint, "No food seems to do him any good; he is smaller than when he was born."

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[1] Second Essay on Diseases of Children. By John Cheyne, M. D. 1802.

If the mother is able to nurse her child, he often goes on well for four or five months, but then being supplied with other and less digestible food, as an addition to the breast-milk—food which is often ill-selected, and consists, not unfrequently, of portions of the meals of his parents—he begins to waste, and the diarrhœa is set up.

The third period at which this disorder is apt to show itself is the time of weaning; and so frequently is this the case, that the disease has obtained the name of atrophia lactantium. It is at this time when, the simple food on which he has hitherto principally subsisted being withdrawn, he is so exposed to danger from the mistaken kindness of his attendants, who, confusing substantial with nutritious food, supply him with articles of diet which they consider suitable to *his* requirements, because they know them to be sufficient for their own. The length of time during which children, amongst the poorer classes, are suckled in this country, also favours the result described. The infant is often kept at the breast long after there is any nourishment to be obtained from his mother's milk. The degree of weakness to which he is reduced by such a system enfeebles his digestive power, and prevents him from assimilating even such a diet as, were he in health, would afford him the nourishment he requires.

Even while at the breast the infant is not exempt from danger. Hired nurses, in whom the breast milk is not sufficient in quantity or quality for the child's support, will often feed him secretly with farinaceous or other food, in order that this deficiency may pass undetected. This is not an uncommon source of disease in very young infants. In these cases it is difficult to extort a confession from the nurse, but our suspicions are often verified by a microscopic examination of the stools, when starch granules will be found in large numbers.

Bad air, want of sunlight, and want of cleanliness, are also fruitful sources of this disease, especially when, as is usually the case, they are combined with the preceding. The crowding together of children in rooms, where they live and sleep in a close atmosphere, is a frequent cause of derangements of the stomach and bowels; and amongst French authors residence in a hospital is systematically included amongst the causes which increase the gravity of these disorders. In an institution with which I have been for several years connected, founded for the temporary reception of single women with their offspring, it was noticed that when the occupants of the infants' sleeping nursery reached a certain number, one or two deaths were certain to occur from bowel complaints, and this in spite of all possible precautions in the way of ventilation, &c. It was only by making arrangements for distributing the number amongst several rooms that this mortality could be avoided.

Chilling of the surface is another common cause of diarrhœa. This will be afterwards discussed under the head of "Prevention."

The diseases which lead especially to this disorder are measles, scarlatina, variola, pneumonia, typhoid fever, croup, bronchitis, angina, and pleurisy. MM. Rilliet and Barthez[1] found that out of 140 cases of secondary chronic diarrhœa in children, 37 had been preceded by measles, 27 by pneumonia, 17 by typhoid fever, variola, and scarlatina, respectively, and 29 by the other diseases which have been mentioned. Of this number, only 21 cases were cured; the others proved fatal.

In older children the presence of the ascaris lumbricoides in the alimentary canal will give rise to a diarrhœa which may continue for months, now better, now worse, and only be finally arrested by the expulsion of the worm. In these cases the diarrhœa is most troublesome at night, the bowel during the day being much less disturbed, and is accompanied by great straining, and often by prolapsus ani.

Besides the causes which have been mentioned, chronic diarrhœa may have also a tubercular origin, arising, however, not directly as a consequence of the tubercle, but as a consequence of the inflammation and ulceration which the presence of tubercle excites. It usually occurs in children who are suffering at the same time from mesenteric phthisis or tubercular peritonitis, of which diseases the presence of this complication very greatly increases the danger. Tuberculous diarrhœa is very rare in infants, and is most common in children between the ages of six and ten years.

Anatomical Characters.—Not unfrequently on opening the bowel after death we find absolutely nothing at all to account for the serious nature of the disease: the alimentary canal may have a perfectly sound appearance from one end to the other.

In other cases we find the mucous membrane of the large intestine studded with fine, dark-coloured points, giving the so-called "cut beard appearance"—an appearance which is due to a ring of congestion round the openings of the little follicles.

In other cases, again, the mucous membrane of the large intestine may be inflamed. The inflammation, however, is seldom general; it is usually limited to the summits of the longitudinal folds into which the lining membrane of the bowel is thrown.

Lastly, the mucous membrane may be not only inflamed, but ulcerated. The ulcers are shallow, and are often difficult to detect except by looking sideways at the surface, for their bases are of the same colour as the parts around them. They may occupy either the summits of the longitudinal folds—when they are elongated and sinuous, or may be situated between the folds—when they are very small and circular.

The mucous membrane, when much inflamed, is often exceedingly soft, and may be much thickened. M. Bouchut, however, states that where the disease is very chronic, and there is great emaciation, the lining membrane becomes thin, and in some cases hardly seems to exist at all.

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[1] Traité des Maladies des Enfants Paris, 1861.

These changes are sometimes found to extend into the small intestine, which may be inflamed or ulcerated for a short distance above the ilio-cæcal valve, but in the large majority of cases the lesions are limited to the colon.

The mesenteric glands are occasionally swollen, but otherwise appear unchanged in structure.

It is probable that these appearances depend upon the passage over the mucous membrane of the larger bowel of the acrid secretions poured out by, and descending from, the small intestine. The contact of these matters irritates the gut in the same way that the skin over the buttocks and inner part of the thighs is irritated by the same fluids when they have been ejected from the body.

Tubercle of the bowels is seen as small gray or yellow granulations beneath the mucous membrane. They may occupy the whole extent of both small and large intestines, but are usually in the greatest quantity in the smaller gut, especially that part of it which is just above the ilio cæcal valve.

The presence of the tubercle excites inflammation, which extends through the thickness of the wall of the bowel, and may glue the serous coat to contiguous parts, so that coils of intestine are matted together, and are often adherent to the peritoneal lining of the abdominal wall.

The mucous membrane ulcerates, and the ulcers are circular or oval, with uneven, jagged edges, red, soft, thick, and rather detached: underneath the borders are seen tubercles, either crude or softened. The ulcers vary much in size: when oval or elongated, their greater diameter lies transversely. The floor of the ulcer is red or grayish, and is formed by different coats of the intestine, according to the depth to which the ulceration has extended. Sometimes they penetrate as deeply as the peritoneal covering of the bowel; but extravasation into the peritoneal cavity is rare, on account of the thickening of the tissue at the base of the ulcer, and the adhesions which are formed with the parts around.

Diagnosis.—It is very important to distinguish the variety of diarrhœa with which we have to deal: whether it is due to a simple catarrh of the intestines, or is dependent upon a tuberculous ulceration of the bowels. To determine this question we must consider the age of the child, the circumstances under which the purging commenced, and the existence of tubercle in other organs.

Tuberculous diarrhœa is exceedingly uncommon during the first year, or even the first two years of life, and therefore its occurrence at this time argues against its being due to tubercle.

If the disease began a few days after birth, or if its commencement is distinctly connected with weaning, or with the administration of unsuitable food, the case is probably one of simple intestinal catarrh.

If it occurs in older children, the other organs should be carefully examined for signs of tubercle. The existence, especially, of mesenteric phthisis, or of tubercular peritonitis, renders the same condition of the bowel exceedingly probable. Even in these cases, however, we cannot be sure of the correctness of our diagnosis, for tubercle of other organs may be complicated by a simple catarrrh of the bowels. The great test is the result of treatment. Tuberculous diarrhœa is so fatal, that if the child recovers, and especially if the purging is found to be arrested by an alteration of diet, or a return to the breast, its non-tuberculous origin is at once established.

The converse of this, however, is not equally true. If the disease resists all treatment, it is not therefore necessarily tuberculous. Simple chronic diarrhœa, as has already been stated, is very frequently fatal.

When the child, after cessation of the diarrhœa and the commencement of convalescence, suddenly ceases to improve, the presence of some complication should be suspected. In such cases the lungs should be always carefully examined for pneumonia.

Prognosis.—Chronic diarrhœa, when it becomes confirmed, is exceedingly fatal, but so long as it remains uncomplicated we may entertain some hopes of a favourable termination.

When secondary to some acute disease, the case is graver than when it is primary and non-febrile from the first.

When it is due unmistakably to error in feeding, we may hope by a change in the diet to arrest the purging before any organic lesion has been set up in the alimentary canal.

The form of stool which is of worst augury is that composed of greenish matter, like chopped spinach, in dirty-brown, stinking fluid, and mixed with purulent mucus and blood. The putridity here results from decomposition of the albumen in the serum, while the purulent and bloody matters, especially if there is at the same time great tenderness on pressure of the abdomen, indicate ulceration of the mucous membrane of the large intestine. The thicker and more homogeneous the motions become, although they may at the same time remain intensely offensive, the more favourable is the prognosis.

The occurrence of any complication should give rise to very great anxiety. Measles especially is apt to cause a sudden and violent increase in the intensity of the diarrhœa, and, besides, its own course is often rendered irregular by the presence of the intestinal disorder, so that retrocession of the eruption and other alarming symptoms may ensue.

The prognosis is also rendered very unfavourable if the tongue become dry and rough, if thrush appear upon the inside of the mouth, or if dropsy occur. If tubercle can be detected in other organs, the diarrhœa is in all probability due to tuberculous ulceration of the bowels: death is in these cases almost certain.

Amongst the favourable signs may be included—continuance of the natural progress of dentition, the appearance of tears, and the occurrence of any eruption[1] (unconnected, of course, with any of the exanthemata) upon the child's body, even although the diarrhœa may not at the time have undergone any visible improvement.

Prevention.—Diarrhœa may be prevented by attention to the diet and general management of the child. All indigestible food is calculated, in its passage through the bowels, to give rise to irritation, and therefore to cause an increased flow of watery fluid from the vessels of the intestines. It is unnecessary to repeat here the directions which have been already given for the feeding of young children, and the reader is referred to the section on the treatment of simple atrophy for full information upon this subject. It may, however, be remarked that the practice of giving to very young children sweet cakes, and articles of confectionery, between their regular meals, and as rewards for good behaviour, is one to be very strongly deprecated. Sweet cakes are especially to be avoided, as they are so apt to undergo fermentation in the alimentary canal.

As cold is so common a cause of diarrhœa in children, great care should be taken to shield them from this source of danger. But they should not, therefore, be confined too strictly to the house. Fresh air is as important to them as simple nourishing food. Healthy infants should be taken out at certain periods of the day whenever the weather permits. It is not so much cold as *damp* air, which is dangerous to infants, and even in damp air, unless it be actually raining, a short expedition is not hurtful to a robust child, provided sufficient precautions be taken. The child should be warmly dressed, should be walked briskly about, and should not be allowed to remain out too long at a time. If there is any wind his face should be protected with a woollen veil. As an additional defence, a flannel bandage should be worn round the body next to the skin. This is an article of clothing no infant or young child should be without. It should be looked upon as a necessary part of his dress. The band should be sufficiently wide to cover the whole belly from the pubes to the ensiform cartilage, and long enough to go twice round the body. It should be secured by buttons or by tapes, not by pins; and in fitting it care should be taken to wrap the bandage tightly round the crests of the ilia so that it may not slip up and leave the lower part of the belly exposed. The band is more elastic if cut diagonally from the piece of flannel.

Sudden changes of temperature are especially to be avoided, and a rapid change from cold to heat appears to be as prejudicial as a similar passage from heat to cold. It is, therefore, necessary to prevent an infant being taken too quickly to a hot fire after exposure to the cold of the outside air. The child should not be allowed to wait, clothed in his out-door dress, in a warm room before taking his airing. He should be taken out directly he is dressed for the walk. While out, he should be kept in movement, and should not be allowed to remain motionless in a current of cold air. If able to walk, he should be placed from time to time upon his feet, and be allowed to trot along holding the hand of his nurse. If the weather is cold, damp, and gloomy, he should be brought back to the house after only a short stay in the open air. A pinched look about the face, with coldness and blueness of the extremities, are certain signs that he is no longer receiving benefit from his airing.

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[1] Underwood, *loc. cit.*

Bathing the chest and belly in the morning, on first rising from bed, with equal parts of vinegar and water, or with a mixture of one part of vinegar, one of eau-de-cologne, and two of water, is said to diminish the susceptibility of the body to the impression of cold. This is worth trying in weakly children.

During dentition the rules here laid down must be especially observed, for it is at such times, when the teeth are pressing through the gum, that diarrhœa is so common. Many children are said always to cut their teeth with diarrhœa. Perhaps, however, dentition in these cases is not so entirely to blame as is commonly supposed. No doubt, during the cutting of the teeth, the bowels generally are in a state of irritability, for we know that at these periods the follicular apparatus of the intestines is undergoing considerable development. The bowels then are ripe for diarrhœa, there is increased sensitiveness to the ordinary exciting causes of purging, but without the presence of these exciting causes diarrhœa is by no means a necessary result of such a condition of the alimentary canal. We find that looseness of the bowels is a more common accompaniment of dentition in summer and autumn than in winter; that is, at a season when the changes of temperature are so rapid and unexpected, and when therefore the child is particularly exposed to sudden chills, rather than at a time of the year when the temperature, though lower, is more uniformly low, and when precautions are more naturally taken against the cold. Dentition, too, commences at a period when the child is beginning to require additional food besides that furnished by his mother's milk and consequently at a time when he is so liable to be supplied with articles of diet unsuited to his age. Even if the diet be a suitable one for the infant when in health, it by no means follows that the same regimen will be found equally appropriate at a time when the febrile irritation set up by the advancing tooth has temporarily reduced his digestive power. His ordinary diet may then become indigestible, and therefore irritating to his bowels.

Treatment.—The marked influence exercised upon chronic diarrhœa in children by variations in the temperature and degree of of moisture of the air indicates an important means of checking the disease.

The infant must be kept as nearly as possible in an equable temperature of from 60° to 65° Fahrenheit. Free ventilation must be sustained by an open fire, or in warm weather by a lamp placed in the chimney; but all draughts of air should be carefully guarded against. Where practicable, two adjoining rooms, having a door of communication between them, should be chosen. The child may then inhabit them alternately, and during his absence the unoccupied apartment can be freely ventilated. Even where this convenience is unattainable, two rooms, although separated from one another by a passage, should be always made use of: the child can be taken from one to the other without danger if wrapped from head to foot in a blanket. At night, air should be admitted into the room as freely as is consistent with the avoidance of draughts; with this object, the door of the room may be left open, or in dry warm weather the window may be opened for a short distance at the top. In damp weather, however, or in seasons when the temperature falls notably at sunset, this must be prohibited. If possible, the infant with his nurse should be the only occupants of the bedroom, and no cooking of any kind should be allowed in either nursery.

The most scrupulous cleanliness must be observed. The nates should be carefully sponged and dried after each motion, and should then be dusted over with powdered lycopodium, or, if the skin is abraded, with equal parts of this and of powdered oxide of zinc; while the whole body should be bathed twice a day with warm water. All soiled napkins must be at once removed from the room, and the night-cot and bedding should be taken away every morning, and freely exposed to the air.

If a flannel bandage has not been previously in use, it must be at once applied as directed above. This precaution should on no account be neglected. Flannel, which is a non-conductor, forms by far the most efficient protection to the belly against sudden changes of temperature. Chronic diarrhœa is, no doubt, frequently kept up by a succession of chills, just as a coryza or pulmonary catarrh may be prolonged almost indefinitely by the same means. By the use of this safeguard, we at any rate insure ourselves from having to deal with a *series* of catarrhs. For the same reason the feet and legs should be covered with woollen stockings. It is well known that cold feet have a very bad effect on irritable stomach and bowels; and in children, otherwise healthy, often produce severe pain in the belly. In a child suffering apparently from abdominal pains the feet should always be examined, and if cold, it is usually found that on warming them the manifestation of pain ceases.

The next thing is carefully to regulate the diet. In chronic diarrhœa children are often excessively ravenous, and the mothers and nurses, true to their principle of giving the most solid food to the weakest children, are in all probability filling him with everything that is most calculated by its indigestible properties to aggravate his abdominal derangement. "The child," they say, "will eat anything," and they give him "anything" accordingly. All this must be at once put a stop to. If the child have been recently weaned, a return to the breast is distinctly indicated. A wet-nurse should be provided, and all other food be strictly prohibited. Even if the child have been weaned some months, this plan is still of service; but in these cases he will frequently refuse the breast, and no persuasions can induce him to return to this mode of feeding. In these cases the diet must be limited to a mixture of equal parts of new milk and lime-water, given in small quantities at regular intervals. The effect of this, however, must be carefully watched, for in severe purgings cow's milk does not always seem to agree. If then the diarrhœa does not improve under its use, and particularly if the motions contain quantities of casein, a change must be made after a day or two, and a tea made of lean mutton or beef be given in its stead; or a mixture of veal broth and barley-water in equal proportions may be substituted for the milk.

Baked flour prepared as recommended by Dr. Underwood,[1] is a very useful diet for infants who will not take the breast during this disease. The flour is slowly baked for a long time in a small covered jar, until it breaks into a soft, grayish-coloured powder. During the progress of the baking, the jar must be occasionally removed from the oven, and its contents stirred up from the bottom and sides: this insures its being equally baked throughout, and prevents the formation of hard lumps. Some of the flour thus prepared is mixed with boiled cow's milk, from which the scum has been removed, and is then thoroughly boiled till it forms a thin custard. For older children, ground rice with milk may be given instead of the baked flour; but it must be very carefully prepared, and be administered in small quantities at a time. Liebig's food is also very valuable in these cases.

The object of this diet is to keep up the nutrition of the body with a minimum amount of irritation to the alimentary canal. Without attention to this point all treatment by drugs is useless, for a knob of indigestible food will neutralize the effect of the most powerful astringents. Too much fluid is also bad, for it is important to keep up the standard of density of the blood. A large quantity of fluid taken at once is directly absorbed from the stomach into the circulation, and is immediately followed by an increase in the flow from the bowels. For this reason liquid food must be given in small quantities, frequently repeated. If the child is thirsty he must not be allowed to drink freely, but fluid must be given him in teaspoonfuls at a time. Cleanliness in the feeding-apparatus is all-important, and the medical man should satisfy himself by inspection that his directions in this respect are properly attended to.

External applications are exceedingly useful in this disease, for the secretion of the skin is usually suppressed at an early period. The hot bath may be used at first every night, with all the precautions already enjoined (see p. 24), and when the prostration becomes marked the mustard-bath may be ordered. In cases where ulceration of the bowel is suspected, and it is thought advisable to apply local counter-irritation, a poultice consisting of equal parts of flour of mustard and linseed-meal should be used. This should be applied at some distance from and not directly over the seat of disease —to the chest, and not immediately to the belly; and its effect should be carefully watched that the irritation thus excited may be kept within due bounds. If the child is very weak, the mustard, after remaining on a few minutes, should be removed, and a hot poultice of linseed-meal should be applied in its place. When the tenderness of the abdomen is very great, it is advisable to keep the whole belly constantly covered with a large linseed-meal poultice. This must be changed frequently, but with great care, that the child be not chilled in the process.

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[1] Diseases of Children, p. 244.

Gentle frictions with the hand over the abdomen and body generally are useful in the earlier periods of the disease, and so long as there is no tenderness of the belly may be continued with advantage. When tenderness is present they should only be used to the legs and feet. In cases of great emaciation, when the purging becomes arrested, frictions with cod-liver oil may be employed; a teaspoonful being rubbed into the chest twice a day. If, however, a return of the diarrhœa follows its use, the oil should be omitted, and dry frictions be returned to, or a stimulating liniment may be used instead of the oil.

Internal remedies.[1]—If the patient is seen at the first, before the diarrhœa has become established, and when there is nothing but pallor, languor, gradual loss of flesh, griping and tenesmus, with scanty, sour-smelling stools, a small dose of powdered rhubarb, with carbonate of soda should be ordered, and then, when the bowels are relieved, a mixture containing tinct. opii with bicarbonate of soda in some aromatic water:—

℞.—Tinct. opii, ♏x;
Sodæ bicarbonatis, ℈ij;
Syrupi simplicis,
Aquæ carui, āā ℥j.—M. Ft. mist. ʒj ter die.

The opium at once renders the peristaltic action of the bowels more regular, and the stools become darker and less offensive in the course of a few days. This, with regulation of the diet, a flannel bandage, and due precautions for the avoidance of cold, is all that is required.

When the purging sets in, if the stools are green, and slimy or watery, with a sour smell, it is best to begin with a dose of bismuth and chalk:—

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[1] All the prescriptions given in this section are adapted to a child of twelve months old

℞.—Bismuthi albi, gr. xvj;
Pulv. cretæ aromat. ℈ij;
Syrupi simplicis,
Mucilag. tragacanth, āā ℥ss;
Aquæ, ℥j.—M. Ft. mistura. ʒj sextis horis.

If there is much tenesmus, half a drop of tinct. opii may be added to each dose of the mixture; or an injection containing four or five drops of laudanum, with five grains of bicarbonate of potash, to half an ounce of thin warm starch, may be thrown up the bowel. Dr. Evanson[1] strongly recommends the addition of the alkali, which, he says, greatly increases the efficacy of the injection.

A mixture containing tinct. opii and castor oil is also very useful if the tongue is furred:—

℞.—Tinct. opii, ♏xvj;
Ol. ricini, ʒjss;
Syrupi zingib. ℥ss;
Mucilag. acaciæ, ℥jss.—M. ʒj ter die.

But it should not be used if the tongue is clean, and must not be continued longer than forty-eight hours if no benefit is found to result from its employment.

So long as the stools remain sour-smelling, antacids should be persisted with. An aromatic should always be combined with the antacid. "This," says Dr. Underwood,[2] "is of more importance than is usually apprehended. I have known a careful attention to this circumstance alone happily suppress complaints in the bowels, which had long continued obstinate, though, in other respects, properly treated." In these cases, too, an emetic is often of great service.

If, when the tongue cleans, the diarrhœa continues, and the stools are found to consist of dirty-brown stinking water, astringents must be used. Of these, the best, perhaps, is a combination of lead and opium:—

℞.—Plumbi acetatis, gr. xvj;
Acidi acetici dil.,
Tinct. opii, āā ♏xvj;
Syrupi simpl. ℥ss;
Aquæ, ℥jss.—M. ʒj ter die.

With this an astringent enema,

℞.—Ext. Krameriæ, gr. xv;
Mucilaginis amyli, ℥iv.—M. Ft. enema,

may be used twice a day, if the emaciation is great, and the diarrhœa very violent. It should be given a quarter of an hour after a copious injection of warm water.

It is well to vary the astringent draught every two or three days, and the following mixtures may be used to alternate with the lead:—

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[1] Diseases of Children. By Maunsel & Evanson, 8vo., 1847.

[2] Underwood, p. 236.

℞.—Tinct. opii, ♏xvj;
Acidi gallici, ℈j;
Syrupi, ℥ss;
Aquæ carui, ℥jss.—M. ʒj ter die.

℞.—Tinct. capsici, ♏x;
Syrupi simp. ℥ss:
Decoct. hæmatoxyli, ℥jss.—M. ʒj quartâ quâque horâ.

This combination of capsicum with the astringent is often exceedingly useful in cases where there is no tenderness of the abdomen or straining. If these symptoms are present it should not be used, but tinct. catechu may be substituted for the capsicum in the proportion of five drops for the dose.

Where the diarrhœa is very obstinate, nitrate of silver is strongly recommended by many authors, and in many cases is very successful in checking the disease after everything else has failed.

R.—Argenti nitratis cryst. gr. j;
Acidi nitrici diluti, ♏v;
Mucilaginis acaciæ,
Syrupi, āā ʒvj.—M. ʒj quartâ quâque horâ

This mixture is especially useful in cases where the emaciation is extreme, and the stools very frequent, non-fecal, and containing variously-coloured mucus and blood. Mr. Aiken states that in a case in which he tried it, "the first dose of the nitrate seemed to increase the discharge. However, in about six hours the dejections improved; they became more feculent, and every symptom underwent a corresponding improvement."[1] When the prostration is great, with aphthous ulcerations of the mouth, the nitrate is often of much service.

Injections of nitrate of silver are valuable in the later stages, particularly if there are any signs of ulceration of the large intestine. The bowel should be first cleared out with warm water, and then an enema, containing one grain of the nitrate to five ounces of water, should be administered. Trousseau recommends that in bad cases it should be repeated twice in the twenty-four hours. These astringent enemata must not, however, be continued too long, they should be suspended every two or three days in order to watch the effect, and in the interval enemata of simple starch may be used as recommended by MM. Rilliet and Barthez.

All this time the diet must be attended to, and all the other precautions already recommended must be continued. The external applications, as before described, must also be made use of, employing more and more decided counter-irritation as the weakness of the child increases, and his prostration becomes more marked.

Stimulants will also be required as the child grows weaker, and must be given pretty freely when the sinking of the fontanelle and the other symptoms show that he is becoming exhausted. Five or ten drops of pale brandy, or double the quantity of dry pale sherry, may be given in milk three, four, six times a day, or even every hour, as required. Good beef gravy, free from fat, is also useful at these times.

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[1] Ranking's Abstract, vol. vi., 1847.

Not seldom, in spite of all our efforts, the child goes on from bad to worse. The diarrhœa resists all treatment, and continues obstinate whatever be the measures adopted. In these cases the treatment by raw meat becomes a valuable resource. All food must be stopped, and the child nourished in the following way. A piece of raw mutton or rump-steak free from gristle or fat, is finely minced, and is then pounded in a mortar till it is converted into a pulp. The pulp is then strained through a fine sieve or a cloth, to remove the bloodvessels and cellular tissue. Of the meat so prepared, a teaspoonful is given at regular intervals four times in the day, and every day the quantity administered is gradually increased, until half a pound is taken each day in divided doses. During this treatment no other food of any kind must be allowed, and no fluid but thin barley-water or a drink made by mixing the unboiled whites of three eggs in a pint of water, sweetening it, and flavouring with a little orange-flower water. This diet usually causes the motions to have an intensely offensive smell; but this is of no consequence, and the parents should be warned of its liability to occur. The patients themselves often like this food and take it eagerly. If, however, as may happen, they show any repugnance to it, the pulp may be sweetened with white sugar, or a little confection of roses may be added to make it more palatable, or it may be given in a small quantity of veal broth. As medicine, we must give at the same time the bismuth and chalk mixture, with the addition of one drop of tinct. opii to each dose. This mode of treatment is strongly recommended by Professor Trousseau, from whom the above method of preparation is derived. There can be no doubt about the value of this remedy. Under its influence the stools become less frequent and less liquid, and although they remain for a time horribly fetid, yet they gradually assume more and more the character of healthy evacuations, while the other symptoms undergo a like amendment. For the first day or two the meat will be found in the motions almost unchanged, except for decomposition, the dejections consisting of colourless fibrine, with a little cellular tissue and mucus; but by perseverance we find that it begins gradually to be digested, and less of it appears every day in the stools.

When from this or other treatment the diarrhœa has been arrested, and the stools have become more healthy-looking, a tonic should be given, and the one best adapted to continue the improvement is the solution of the pernitrate of iron, which has besides a beneficial influence upon the alimentary canal. It is best given with dilute nitric acid:—

℞.—Liq. ferri pernitratis, ʒss;
Acidi nitrici diluti, ʒss;
Syrupi zingib. ℥j;
Aquæ anethi, ad ℥iij.—M. ʒij sextâ quâque horâ.

Other tonics may afterwards be given, as the decoction of bark with syrup, the citrate of iron and quinine, cod-liver oil, &c. If the oil be given, its effects must be carefully watched. It is best to begin with a small dose, as ten drops in a teaspoonful of milk three times in the day; but if there is any smell of the oil in the stools, even this small quantity must be diminished. The constipation, which usually succeeds to the diarrhœa, should not be lightly interfered with. If two or three days have passed without any action of the bowels, a very small dose—about twenty drops of castor oil may be administered, and may be repeated, if necessary, after four or five hours.

After the cessation of the diarrhœa the child must not be kept too low. As his digestive power increases, his diet should be improved in proportion. This is very important, as rickets is not an uncommon result of the impairment of nutrition produced by the disease, and is therefore favoured by anything which tends to prolong the weakly condition of the infant.

CHAPTER III.

CHRONIC VOMITING.

Chronic Vomiting, its Symptoms and Treatment.—Frequency of slight attacks of gastric disturbance—Such attacks easily remedied—Chronic vomiting non-febrile—Symptoms, those of gradual interference with nutrition, ending in exhaustion—Spurious hydrocephalus.

Causes. Diagnosis—From tubercular meningitis—Diagnosis of spurious hydrocephalus.

Treatment.—Attention to diet—Return to breast—Substitute for wet-nurse—Warmth—External applications—Baths—Medicines—Bismuth and magnesia—Calomel—Dilute hydrocyanic acid—Enemata—Emetics—Rules for giving these—Stimulants.

Slight attacks of vomiting, lasting for twenty-four hours, or even for several days, are not at all uncommon in infants even while at the breast. The matters ejected consist of the food, of stringy mucus, and of bile; at the same time there is some heat of skin, thirst, loaded tongue, and constipation or diarrhœa. These attacks, unless aggravated by much meddling, always end favourably. The only treatment required is an emetic of ipecacuanha wine to relieve the stomach, followed by a gentle purge, and by careful regulation of the diet. Sometimes it is necessary to forbid even the breast-milk for a time, and to restrict the infant to cold thin barley-water given with a teaspoon.

These attacks are of little consequence. The child may get a little flabby and pale, but when convalescent a week of ordinary feeding restores him to his former state of health. Vomiting may, however, become chronic and persistent. It is then much more serious, and produces very great wasting and prostration.

Symptoms.—There is no fever. The child vomits at irregular intervals, throwing up the milk curdled and sour-smelling, and, at the first, tinged green or yellow from bile. The bile, however, soon disappears from the vomited matters, and clear fluid, like water, is ejected, alone or mixed with the food. On pressure of the epigastrium the child writhes as if in pain. The belly is full, often tympanitic, and gurgles when pressed upon. Eructations occur of fetid, sour gas, and the bowels are obstinately confined. An eruption of strophulus often covers the body and arms. The child gets thinner and paler, and is very fretful. The fontanelle becomes depressed. Some diarrhœa may at first alternate with the constipation, but after a few days the bowels become again confined, and the motions, when they occur, consist of round, hard lumps, very light-coloured, evacuated with great straining. The lumps may be covered with tough mucus. The tongue is coated with a thick layer of dirty-yellow fur: it is not very moist, and dull-red papillæ of medium size are seen peering through the fur, here and there, on the dorsum of the tongue. The breath smells sour. The lips are dry and red. A furrow passes down from each side of the nose to encircle the corner of the mouth, so that the lips seem to project. The mouth seems clammy and parched, and the child takes the breast eagerly to relieve this parched feeling by the flow of milk, but rejects what he has swallowed very shortly afterwards.

After the child has remained in this state for a considerable time, often with occasional intervals of improvement for several months, the vomiting becomes more frequent. It occurs not only after taking food, but also in the intervals of feeding, and seems to be excited by the slightest movement, or by a touch, so that the mere act of wiping the mouth may bring on a fresh attack of retching. The milk is thrown up uncurdled. Emaciation then goes on rapidly. The skin is dry and harsh, and hangs loose and flaccid: the eyes get hollow; the nose sharpened; the cheeks sunken; and the belly retracted. He lies with the knees drawn up on to the abdomen, and, when they are straightened out, returns them as soon as possible to their former position. Occasionally he moves his legs uneasily, as if in pain. He is intensely fretful, breaking out into sudden cries, or, as he becomes weaker, into a low, pitiful wail, which is even more distressing to hear, and never seems to sleep, night nor day. The tongue is dry, and is still furred, so that it has a rough, granular appearance. At length the child is reduced to a state of extreme emaciation. The surface of the body is pale and cold; the hands and feet become more or less purple; vomiting occurs at the slightest movement; the child lies dosing or in a state of semi-stupor, with eyes half closed, and the only sign of vitality is his respiration. When thrush appears upon the inside of the cheeks and lips, it is a sign that the end is approaching, and he gradually sinks and dies, the constipation persisting to the last.

Towards the end of the disease, symptoms which have been described as "spurious hydrocephalus" are often noticed. Dr. Gooch,[1] in his valuable paper on this disorder, says, "it is chiefly indicated by heaviness of head and drowsiness; the age of the little patients whom I have seen in this state has been from a few months to two or three years; they have been rather small of their age, and of delicate health, or they have been exposed to debilitating causes. The physician finds the child lying on its nurse's lap, unable or unwilling to raise its head, half asleep, one moment opening its eyes, and the next closing them again with a remarkable expression of languor. The tongue is slightly white, the skin is not hot, at times the nurse remarks that it is colder than natural; in some cases there is at times a slight and transient flush: the bowels I have always seen already disturbed by purgatives, so that I can scarcely say what they are when left to themselves: thus the state I am describing is marked by heaviness of the head and drowsiness, without any signs of pain, great languor, and a total absence of all active febrile symptoms."

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[1] On Symptoms in Children erroneously attributed to Congestion of the Brain. New Sydenham Society, 1859.

The symptoms thus described are not peculiar to chronic vomiting, although they are especially apt to occur with that disease. They may be found in all cases where great exhaustion is induced from whatever cause, and are therefore not uncommon in chronic diarrhœa. In all these cases the fontanelle is deeply depressed, showing deficiency in the amount of blood circulating through the brain; the pupils are often dilated and immovable, and there may be coma, with stertorous breathing.

In cases of recovery the vomiting becomes less frequent, and gradually ceases, although for some time it is liable to recur if much food be taken at once. The constipation, however, remains obstinate for some time after the cessation of the vomiting. The child then begins to regain flesh, and often becomes exceedingly fat.

Causes.—All the cases of this disorder which have come under my notice have been in infants of a few months old, and have usually resulted from premature weaning, the child being taken from the breast and fed upon farinaceous, or other articles of diet which he is unable to digest. It is not an uncommon complaint in infants whose mothers have obtained the situation of wet-nurse, and who are in consequence left to the care of ignorant and often careless attendants.

The crowding of children together in close nurseries, or amongst the poor, the stifling atmosphere of the one room in which a whole family is so often lodged, is another common cause of the disorder.

These causes have already been fully discussed under the head of chronic diarrhœa.

Diagnosis.—The combination of obstinate vomiting, with constipation, might give rise to the suspicion of tubercular meningitis, but the two diseases are readily distinguished. The age of the child, tubercular meningitis being exceedingly rare under twelve months; the absence of fever; the depressed fontanelle; the rapid, feeble, but regular pulse; the state of the belly, swollen rather than retracted; all tend to exclude the latter disease.

Towards the end of the complaint, when the symptoms of spurious hydrocephalus are noticed, the history of the case, the coldness of the skin, the depressed fontanelle, and the state of the pulse, are all adverse to the idea of cerebral lesion, and point to the true nature of the complication, viz., a deficiency of blood circulating through the brain.

Treatment.—Our first care must be to attend to the proper feeding of the child. If he has been prematurely weaned a wet-nurse should be provided, and great care must be taken that the person selected should produce milk of a quality suited to the infant, for the milk of different nurses differs very much in quality. If, therefore, a return to the breast is not followed by the expected improvement, the nurse should be changed, or measures should be taken to render the secretion better adapted to the infant. If, on examination, the milk appears to be deficient in fat globules, a more nourishing diet should be recommended; if, on the other hand, it be too rich, the amount of meat must be restricted, and she should take fresh vegetables, with an occasional saline aperient. If these measures do not succeed, there should be no hesitation about changing the nurse, if another can be procured.

When the disease has continued a long time, and the child is much reduced, the mere act of sucking appears often to excite retching. In such cases the nurse's milk may be given with a teaspoon. In all cases the child should take the breast at regular intervals, and should not be allowed to suck too long at one time; the amount of nourishment he is permitted to swallow being regulated, on each occasion, by the degree of irritability of the stomach, and by the result which has followed the previous meal. If that has been rejected, the quantity of milk allowed to be drawn at the next suckling must be diminished. In many cases a teaspoonful of the breast-milk given at intervals of ten minutes, or even longer, is all that can be retained. Often, however, on the other hand, the stomach, which has rejected all other food, at once recognizes the change of diet, and the vomiting is speedily arrested by a return to the breast.

If a wet-nurse cannot be obtained, ass's milk, or equal parts of cow's milk and lime-water, must be given instead, beginning with very small quantities at the first. These can be gradually increased according to the readiness with which they are retained. In some cases, where milk alone, or with lime-water, is persistently vomited, Liebig's food prepared with milk is kept down. This should always be tried in obstinate cases.

The infant should be warmly clothed, with a flannel bandage round the belly, and, while the vomiting is urgent, should be kept in a room comfortably warm, but not too hot. Fresh air should be freely admitted, and at night, if there is no fire, a lamp should be placed in the chimney. Great cleanliness should be maintained; cloths and linen moistened with the vomited matters should not be allowed to remain in contact with the child's body, but should be at once removed from the room. The whole body should be well sponged with warm water twice a day.

It is extremely important to keep the feet warm. Thick woollen socks should be supplied, and the feet should be occasionally well rubbed with the hand alone, or with a liniment composed of equal parts of linimentum camphoræ co. and linimentum saponis. If they still continue cold, they may be placed in a mustard foot-bath, with water sufficient to cover the lower extremities as high as the knees. Warm applications to the epigastrium and belly are of great service; hot linseed-meal poultices, made more stimulating by the addition of a little mustard, should be applied to the pit of the stomach, and at times frictions may be used over the belly with the same embrocation as has been directed for the feet. If there is great prostration, the child may be placed for a few minutes in a bath of the temperature of 90° Fahr., or the mustard-bath may be used as already directed (see Introduction). All these applications are useful, not only as counter-irritants, but also as tending to promote the free action of the skin. With the same object inunctions of cod-liver oil may be used, a teaspoonful being rubbed into the skin over the chest and belly twice a day. By this means, also, a considerable quantity of nourishment can be introduced into the system; it is a measure which should never be neglected when the vomiting is obstinate.

With regard to the medicines[1] to be employed:—if the child is seen early, before the strength is much reduced, and there is a sour smell from the breath, with a thickly-furred tongue, an emetic should be at once administered. A teaspoonful of ipecacuanha wine is the best form in which this can be given. Afterwards, when the stomach has been emptied of the acrid secretions and mucus, a mixture containing bismuth with magnesia should be ordered:—

℞.—Bismuthi alb., gr. xvj;
Magnes. carb., ℈ij;
Tinct. myrrhæ, ʒss;
Syrupi,
Mucilag. tragacanth., āā ℥ss;
Aquæ, ad ℥ij.—M. ʒj ter die.

The bowels, which are usually confined, should be excited to act by an enema. For a child of six months old, a small teacupful of warm barley-water, containing a tablespoonful of olive oil, may be injected into the bowel, or ten grains of powdered socotrine aloes dissolved in the same quantity of barley-water, or of boiled milk, may be used. The action of the bowels must be maintained either by enemata, by suppositories of Castile soap, or by purgatives given by the mouth. The latter method is inapplicable as long as the vomiting continues incessant; but when this becomes less frequent, a grain of calomel may be placed on the tongue, or a mixture containing ten to twenty drops of tinct. aloes may be given two or three times in the day. The tincture of aloes is strongly recommended by Dr. Davies[2] in these cases, combined with a few drops of sal volatile.

If the vomiting continues unabated, small quantities of calomel may be given; a sixth of a grain being laid on the tongue every four hours. The effect of this medicine is sometimes very striking; as the nurses say, "it acts like a charm." Should this, however, not succeed, small doses of dilute hydrocyanic acid may be given with nitre, as in the following mixture. Nitre is a powerful sedative to the stomach:—

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[1] All the prescriptions given in this chapter are adapted to an infant of six months old.

[2] See Underwood's Treatise on Diseases of Children, p. 227.

℞.—Acidi hydrocyanici diluti, ♏vj ;
Potas. nitratis, ʒj ;
Syrupi, ℥ss ;
Aquæ, ℥jss.—M. ʒj ter die.

And if, in spite of this, the irritability of the stomach remains undiminished, half a drop of tinct. opii may be added to each dose of the mixture.

The same remedy should not be continued too long at a time, if no improvement is seen to follow its employment. Our greatest trust should be placed in warmth, stimulation of the surface, and promoting free action of the bowels. When the fontanelle becomes much depressed, stimulants are always indicated; and of these pale brandy given in five-drop doses, in a teaspoonful of breast-milk, or of the milk and lime-water, seems to answer the best. When the prostration is great the stimulant may be repeated every hour, or even oftener.

With regard to a repetition of the emetic, a few words may be said. An emetic is only required when there is reason to suspect the presence of acrid secretions in the stomach. If, however, the tongue is tolerably clean, and there is no sour smell from the breath, an emetic is no longer indicated, and its employment would only increase the prostration. Vomiting is sometimes kept up by debility of the stomach, and this would be only increased by the exhibition of nauseating remedies. When the prostration, as shown by the condition of the fontanelle, is very great, much caution should be exercised in giving emetics, as fatal syncope is sometimes seen in such cases to follow their employment, and if the fontanelle is deeply depressed they should on no account be made use of.

If the vomiting continues after the tongue has become clean, stimulants should at once be given, and the following are very useful:—

℞.—Sp. ammon. aromat.,
Æther. chlor. āā ʒss ;
Ext. glycyrrhizæ, ℈ij ;
Decocti cinchonæ, ℥ij.—M. ʒj ter die.

℞.—Acidi nitrici diluti,
Sp. Æther. nitrici, āā ʒss ;
Tinct. myrrhæ, ʒj ;
Syrupi zingib. ℥ss ;
Aquæ carui, ad ℥ij.—M. ʒj quartâ quâque horâ.

Either of these may be used, and should be continued for some time after the vomiting has ceased.

As the child improves he may be taken out of doors, if the weather is not too cold, for a free supply of fresh air is a most important agent in the treatment of this as of all the other chronic diseases of children.

The symptoms which have been described as "spurious hydrocephalus" show a very dangerous degree of prostration, and must be treated with stimulants.

CHAPTER IV.

RICKETS.

Rickets.—Preliminary symptoms those of general malnutrition—Symptoms of commencement—Deformities of bones—enlargement of ends of bones—Softening—Thickening of flat bones—Mechanical deformities—Bones of head and face—Distinction between the rickety and hydrocephalic skull—Craniotabes—Dentition—Spine—Thorax—Deformities of long bones and of pelvis—Arrest of growth of bones—Articulations—Relaxation of ligaments—Other symptoms—Enlargement of liver and spleen—Intellect—Complications—Catarrh and bronchitis—Diarrhœa—Laryngismus stridulus—Convulsions—Chronic hydrocephalus—Death from intensity of general disease.

Pathology.—Rickets a general disease—Anatomical characters of bony changes—Kölliker's views—Virchow's views—Analysis of rickety bone—Emphysema and collapse—Alterations in lymphatic glands—In spleen—Liver—In other organs—Urine.

Diagnosis. Prognosis.—Importance of complications.

Causes.—Rickets not a diathetic disease—Bad feeding and hygiene—Connection between rickets and syphilis.

Prevention. Treatment.—Diet—Dry bracing air—Attention to digestive organs—Tonics—Value of mechanical supports—Treatment of complications—Catarrh—Diarrhœa—Bronchitis—Laryngismus stridulus.

Rickets, although one of the most preventable of children's diseases, is yet one of the most common. It begins insidiously, presenting at first merely the ordinary symptoms of defective assimilation, and attention is often not attracted to it until the characteristic changes occur in the bones which place the existence of the disease beyond a doubt.

Many of the symptoms described under the head of simple atrophy, constitute a preliminary stage of rickets. They are not, as has been said, characteristic of this special disease, but merely mark the process of gradual reduction of strength, and of interference with the assimilative functions, which must take place to a certain degree before the disease can be established. This preliminary stage is not, however, always present. Rickets is the result of malnutrition: any disease, therefore, which seriously interferes with the assimilative power, and causes sufficient impairment of the general strength, may be followed directly by the disorder under consideration, without any intervening stage. Reduce the strength to a given point, and rickets begins. Prolong this state of debility sufficiently, and the characteristic changes resulting from the disease manifest themselves. Any cause, therefore, which will reduce the strength to this point lays the foundation of rickets.

Symptoms.—The commencement of the disease is indicated by the following symptoms:—

Profuse sweating of the head, or of the head, neck, and upper part of the chest. The perspiration is extreme: it will be seen standing in large drops upon the forehead, and often runs down the face. There is increased moisture of the parts usually in the day as well as at night; but if the child falls asleep, it is instantly augmented, and at night is sufficient to make the pillow wet. When awake, the slightest exertion or elevation of the temperature excites it at once. At the same time, the superficial veins of the forehead are large and full, the jugular veins are distended, and the carotid arteries may sometimes be felt strongly pulsating. The irritation excited by this constant perspiration will often give rise to a crop of miliaria about the temples, the upper part of the forehead close to the roots of the hair, and at the back of the neck. While the head and neck are thus bathed in perspiration the abdomen and lower limbs are usually dry and hot.

Another characteristic symptom is the desire of the child to lie cool at night. In the coldest weather he will kick off the bed-clothes, or throw his naked legs outside the counterpane. The mother often notices this as one of the earliest symptoms, and will say that she has been obliged to wrap her child up in flannel to prevent his catching cold, as he will not remain covered by the bed-clothes.

These two symptoms precede the deformities of the osseous structure; but there is another symptom which appears later, and marks the commencement of morbid changes in the bones. It is, however, frequently absent in mild cases. This symptom is general tenderness. The child at first shows signs of uneasiness when danced up and down in the arms of his mother. As the tenderness increases, he becomes peevish at being touched, and prefers sitting quietly in his little chair, or lying down in his cot, for all voluntary movements increase the pain. Eventually, as the disease progresses, he lies motionless in his bed, and cries violently even at the approach of persons who have been accustomed to play with him. This conduct, so different from that of a healthy child, who delights in all movement, is highly characteristic.

These special symptoms are accompanied by all the other phenomena which preceded the commencement of the disease. The bowels remain confined, or are more or less capricious, a day or two of relaxation being followed by an equal period of constipation. More often, however, there are three or four evacuations in the course of the twenty-four hours, accompanied by considerable straining. The stools consist of whitish, curdy-looking matter, mixed with mucus, and are extremely offensive. The food taken seems to pass almost unchanged through the alimentary canal, being, no doubt, forced too rapidly along from abnormal exaltation of the peristaltic action of the bowels, so that sufficient time is not allowed for digestion. The urine becomes more abundant, and deposits a calcareous sediment, or abounds in phosphates. There is usually some thirst; but the appetite is often voracious, so that the child very shortly after a meal will show a disposition to eat again. This is what we constantly meet with in cases of dyspepsia in the adult, where the peristaltic action of the intestines is unnaturally brisk. The child soon loses his power of walking, and sits, or lies about. He becomes dull and languid, and neglects his playthings. There is usually some emaciation; but if the symptoms are not severe at the first, he may be plump in appearance, although his flesh feels soft and flabby. In the daytime he is drowsy, but at night is restless, turning his head uneasily from side to side on the pillow.

The symptoms proper to rickets very seldom appear before the fourth month, and not commonly before the seventh or eighth. From my own experience, I should say that the disease manifests itself most frequently between the seventh and eighteenth months, less frequently between the eighteenth month and the end of the second year, and rarely after the end of the second year. Still, we may find it commencing at a later period; and Sir William Jenner mentions the case of a girl, aged nine years, who was then only just beginning to suffer.

The deformities of the bones usually begin at the time when general tenderness is first complained of. The osseous system is attacked as a whole, and therefore all the bones in the body seem to suffer at the same time. Sir William Jenner,[1] in his valuable Lectures on Rickets, thus enumerates the most constant changes which are found to occur in them.

"Enlargement of the ends of the long bones, of the parts where the bone and cartilage are in contact, *i.e.*, where the cartilage is preparing for ossification, and where ossification is advancing in the cartilage.

"Softening of all the bones.

"Thickening of the flat bones, *e.g.*, the bones of the skull; the scapula; the pelvis.

"Deformities which follow from mechanical causes acting on the softened bones, *e.g.*, the deformities of the thorax, pelvis, spine, long bones."

In a well-marked case of the disease we find all these changes; but very commonly many of them are absent. Even when present, they do not always occur to an equal degree: sometimes the softening of the bones is more marked than their enlargement; at others, the enlargement is out of proportion to the softening. M. Guérin[2] has stated—he has even laid it down as an absolute rule—that the deformities of the bones begin from below upwards, that the tibiæ become affected before the thigh bones, the thigh bones before the pelvis, and so on to the arms and head. This, however, is not correct. In some cases we certainly find the legs and thighs bowed earlier than the other parts, but it is in children who have walked, or can still walk; and in them the weight of the body determines the deformities of the lower limbs before the pressure upon the other bones has been sufficient to make them crooked. Besides, if a very heavy child be put on his legs at too early an age, the tibiæ, as Sir William Jenner has pointed out, may bend a little, although there is no reason to suspect the child of being the subject of rickets.

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[1] Medical Times and Gazette, March 17, 1860.

[2] Mémoire sur le Rachitis. Paris, 1857.

The changes in the different bones will now be described.

Bones of the head and face.—The skull is larger than it ought to be, and is of a peculiar shape. Its antero-posterior diameter is increased; the fontanelle remains open—often widely open—long after the end of the second year, the ordinary period of its closing: the thickening of the bones is most marked at the centres of the parietal bones, the bosses of the temporal bones, and at the edges of the bones outside the sutures, so that the situation of the sutures is indicated by deep furrows; the vertex is flattened, and the sutures are expanded or remain open. The forehead is high, square, and projecting, and is out of proportion to the face. This disproportion is exaggerated by the arrest of growth of the bones of the face, particularly of the bones of the upper jaw and the malar bones; therefore, while the forehead is larger, the face is smaller than natural. The projection of the forehead is due partly to thickening of the frontal bone, partly to expansion of the frontal and ethmoidal sinuses, but principally, according to Sir W. Jenner, to disease of the cerebrum. The under jaw appears rather elongated.

It is important to distinguish between the rickety enlargement of the skull, and the expansion which takes place in hydrocephalus. In hydrocephalus there is greater disproportion between the skull and the face; the enlargement is more globular and regular, the antero-posterior diameter not being greater than the lateral; the bones of the skull do not give to the finger the sensation of being thickened; the fontanelle is more open, and if the accumulation of fluid be great, the bones at the sutures are more widely separated; the sutures themselves are not bounded by a ridge of thickened bone. The fontanelle in hydrocephalus is elevated; in rickets it is depressed, partly on account of the debility, partly on account of thickening of the bones which form its boundaries. In rickets we find other well-marked symptoms showing the nature of the disease, The two diseases are, however, occasionally combined, and the diagnosis may be thus rendered difficult; but so long as the fontanelle remains depressed, we may positively exclude hydrocephalus.

A curious condition of the skull, known as cranio-tabes, is sometimes found. This was first detected by Elsässer,[1] and has been carefully described by Dr. Alfred Vogel,[2] of Munich. On using gentle pressure with the tips of the fingers on all the posterior surface of the head, spots can be sometimes detected where the bone is thinned. The bone at these spots is elastic, feels "like cartridge paper," and presents a concavity, or depression, which varies in size according to the extent of the thinning. The usual size of these depressions varies from a linseed to a bean; but, according to Dr. Vogel, one whose size does not exceed a line in diameter can be detected by the practised finger.

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[1] Der weiche Hinterkopf. Stuttgart, 1843.

[2] Lehrbuch der Kinderkrankheiten von Dr. Alfred Vogel. Erlangen, 1863.

These local losses of substance are confined to the occipital bone, of which any part may be affected except the protuberances. The frontal and parietal bones are, however, greatly thickened, often to double their natural depth.

This cranio-tabes is said by Dr. Vogel to be one of the earliest signs of rickets preceding the beading of the ribs. It is seldom found before the third month, or after the second year.

The progress of dentition is arrested. If the disease makes its appearance before any of the teeth are cut, their evolution may be almost indefinitely postponed. If some teeth have already appeared, the further progress of dentition is interrupted. This influence over the teeth is peculiar to rickets. In no other disease, in which general nutrition is affected, do we find any interference with the natural course of dentition. In a child greatly wasted by chronic diarrhœa, or improper food, the development of the teeth does not seem to be hindered by causes which exercise so powerful an influence upon his general health; and in tuberculosis and congenital syphilis the teeth are usually cut early.

Teeth which have already appeared, speedily become black, decay, and drop early from their sockets. This is due, according to Dr. Vogel, to insufficient development of the dental enamel. It is not at all uncommon to see a rickety child of eighteen months or two years old with very few teeth as yet in his head, and those few black and carious.

The spine is bent, but the curvature is only strongly marked when the muscular debility is very decided.[1] The direction of the curve varies according to whether the child can or cannot walk. If the child cannot walk, the cervical anterior curve is increased, and there is a posterior curve reaching from the first dorsal to the last lumbar vertebra. This, says Sir W. Jenner,[2] is an exaggeration of the ordinary curve which exists when a child sits unsupported on the arm of his nurse. If the muscular debility is very great, the curvature may be so pronounced as to be mistaken for angular curvature. It is, however, readily distinguished by holding a child up, supporting him with the hands under the arms: the weight of the body will then usually straighten the spine at once, particularly if gentle pressure is at the same time made on the projecting part.

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[1] Jenner, Medical Times and Gazette, 1860.

[2] *Loco citato.*

If the child is able to walk, the dorsal spine is curved backwards, the lumbar forward.

As a consequence of the cervical curve, and the accompanying weakness of the muscles, the head is no longer efficiently supported: it therefore falls back, and the child usually favours this falling back, in order that he may see what is going on around him.

Lateral curvatures are occasionally seen, but they are far less common than the antero-posterior. Their direction is determined by the position assumed by the child. If he is carried constantly on the left arm, there is lateral curvature, with convexity to the left; if on the right arm, the convexity is to the right.

The thorax is curiously deformed. Flattened behind, projecting sharply in front, it presents an appearance which Glisson[1] compares to the prow of a ship, and which forms the condition commonly known as "pigeon-breasted." The ribs, as they leave the spine, are directed at first almost horizontally outwards, then bend sharply at an acute angle at the junction of the dorsal and lateral regions, and from that point pass forwards and inwards to unite with their cartilages. The cartilages curve outwards before turning into their articulations with the sternum, so that the breast-bone is forced forwards, and the antero-posterior diameter of the chest is unnaturally increased. The lateral diameter is greatest opposite the acute angle formed by the ribs; least, at the points of junction of the ribs with their cartilages. This curving inwards of the ribs, and outwards of the cartilages, forms a groove on the antero-lateral face of the chest which reaches from the ninth or tenth rib below, to the third, second, or even first rib above, and the groove is deepest just outside the nodules formed by the enlarged ends of the ribs. The groove varies on the two sides in length and in depth, for the liver and the heart support to a certain extent the ribs under which they lie. Thus the groove reaches downwards to a less distance on the right side than on the left, on account of the liver; and at the level of the fourth and fifth ribs it is shallower on the left side than the right, on account of the heart. The enlargement of the ends of the ribs gives a peculiar appearance to the surface of the chest; a line of nodules is seen, looking like a row of large beads under the skin, lying along the inner side of the groove. Below the sixth rib the chest widens, as the walls are forced outwards by the underlying liver, stomach, and spleen.

If we strip a rickety child and watch his breathing, we see that in inspiration there is sinking in of the chest walls. The lateral depressions deepen; the sternum moves forwards; the abdomen expands; and a deep horizontal groove furrows the surface, dividing the chest from the belly, and marking the upper borders of the abdominal viscera. This recession of the chest walls shows the mechanism by which the deformity is produced. In the healthy subject, when the diaphragm contracts, and the ribs are elevated in the act of inspiration, air rushes in through the glottis to expand the lungs, and to enable them to follow and remain in contact with the retreating chest walls. The atmospheric pressure is, therefore, overcome by the power of the osseous and muscular walls, aided by the pressure of the inspired air. In the rickety child, however, one of these agents is comparatively powerless. The softened ribs can afford little assistance to the air within the chest in counterbalancing the pressure outside: they therefore sink in at their least supported parts, and produce the lateral furrows which have been described, while at the same time the sternum is carried forwards in proportion to the recession of the ribs.

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[1] De Rachitide, sive Morbo Puerili. F. Glisson, edit. tertia. Lugdunum Batavorum, 1671.

Sir William Jenner denies the truth of Rokitansky's statement that want of power in the inspiratory muscles is the cause of the deformity. Repeated dissections have conclusively proved to him that the points of insertion of the muscles of respiration and the points of recession of the chest walls, have no correspondence whatever. He also denies the influence of the diaphragm in producing the circular or horizontal depression described above. That depression corresponds, not to the points of attachment of the diaphragm, but to the upper borders of the liver, stomach, and spleen, which thus support the parietes, and prevent their sinking in under the pressure of the air. A similar cause produces an apparent bulging of the præcordial region during inspiration, for the heart supports the ribs behind which it lies, and prevents their receding to the same extent as the walls around.

The thoracic deformity is sometimes seen to lessen at the time the legs are bending. Sir William Jenner believes this to be due to the disease having diminished, and the muscular power having increased sufficiently to allow of the child walking before the bones of the legs are strong enough to bear the weight of the body.

The *clavicle* is also distorted. There are two great curves: the principal one, forwards and rather upwards, is situated just outside the points of attachment of the sterno-mastoid and pectoral muscles. The second, backwards, is about half an inch from the scapular articulation.

The *humerus* is sometimes curved just where the deltoid muscle is inserted.

The *radius* and *ulna* are curved outwards, and also twisted.

These deformities are ascribed by most authors to muscular action aided by the weight of the limb. Sir W. Jenner,[1] however, excludes altogether the first-mentioned cause from any share in the production of these distortions. They are due, he says to the habit practised by all rickety children, owing to their deficiency in muscular power, of supporting the body, while sitting, upon the open hands placed upon the bed or floor. The weight of the trunk is therefore in a great measure thrown upon the arms, and we see in consequence the deformities of the clavicle, the humerus, and the bones of the forearm, which have been described. The curvature of the humerus is also aided by the weight of the forearm and hand when the limb is raised by the action of the deltoid. The weight of the arm on the humeral end of the clavicle—the sternal end being supported by its muscles and ligaments—will also assist in producing the disfigurement of the collar-bone.

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[1] Medical Times and Gazette, March 17 1860, p. 262.

The *scapula* is very much thickened, and is said occasionally to be so deformed as to interfere with free motion of the shoulder-joint.

The *pelvis* varies greatly in shape, but according to Sir W. Jenner, is more often triangular than oval. Pressure may be brought to bear upon it in many different directions: thus it is pressed upon from above by the weight of the spine and the contents of the abdomen; from below by the heads of the thigh bones. The exact direction in which these compressing forces will act varies, firstly, according to the position of the child—lying, sitting, standing, or walking; and secondly, according to the age at which the disease comes on, and therefore according to the degree of ossification of the bones, for the cartilages are less yielding than the bones themselves. The distortion of the pelvis thus produced is often very remarkable. In a child of four and a half years old,[1] in whom lithotomy was performed by Sir Henry Thompson, at University College Hospital, the outlet of the pelvis was so contracted as barely to allow a stone, measuring $1\frac{1}{8}$ in. in length, $\frac{7}{8}$ in. in breadth, and $\frac{5}{8}$ in. in thickness, to pass through in its long axis. The child died shortly after the operation from peritonitis, and on examination of the pelvis, the brim was found to be exceedingly contracted. Its shape was obliquely caudate: the sacral promontory was distant $\frac{1}{8}$ in. from the left pubic ramus, $\frac{5}{8}$ in. from the pubic ramus of the right side, and $\frac{7}{8}$ in. from the symphysis of the pubes.

Besides the softening of the bones there is, however, another cause which assists to produce a diminished capacity of the pelvis, as will be afterwards explained.

The *femur* is curved forwards if the child cannot walk. If he can walk it is curved forwards and outwards, being an exaggeration of the natural curve. Sometimes the head of the femur is seen bent at an acute or an obtuse angle to the shaft.

The *tibia*, before the child walks, is curved outwards, and the knees are then seen, as the child is held upright, to be widely separated from one another. After the child walks, the weight of the body determines the bending. In these cases the distortion is seen principally at the lower third, and the curve is very abrupt, seeming to project over the foot; or the bend may be outwards, projecting over the outer ankle.

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[1] An account of this case will be found in the Medical Times and Gazette for December 5, 1863.

In these cases, also, Sir William Jenner[1] denies the influence of muscular action. While the child sits in his mother's lap the weight of the legs and feet, pulling upon the lower end of the femur, produces the forward curvature of that bone. As the child sits cross-legged on the floor or bed the pressure on the external malleolus causes the normal curve of the tibia to be exaggerated.

The changes in the bones thus described may take place to any degree. Some may be more marked, others less, according to the severity of the disease, the age of the child, and the time at which treatment is commenced. If the premonitory symptoms have been very mild, tenderness may be altogether absent, and the affection of the bones be limited—at any rate, at first—to beading of the ribs, enlargement of the wrists and ankles, retardation of dentition, and abnormal openness of the fontanelle. The child, if able to walk, is still pretty strong on his legs; he is lively, often plump, and does not appear to suffer much from the disease under which he is laboring. If treatment is at once had recourse to, nutrition is restored, growth and development recommence, and health quickly returns. On the other hand, if the general symptoms which precede the attack have been very severe, *i. e.*, if the debility resulting from the deficient nutrition is very great, the tenderness of the bones is a well-marked symptom, the softening will usually precede, and be out of proportion to, the enlargement of the ends of the bones, and all the distortions which have been described will be the result.

Again, the older the child when rickets first appears the less likely is he to be affected early by softening of the bones, while if the child is very young, the bones usually soften very quickly. This, however, is perhaps merely a consequence of what has just been stated, for the younger the child the more likely is his system to be profoundly affected by malnutrition, and therefore the more severe will be the consequences of that malnutrition.

Besides the softening of the bones, and the deformities which result from it, there is another effect of the disease which is not less remarkable. This effect is the arrest of growth of the bones.[2] The arrest is seen not only while the disease is still in progress, but it even continues after apparent restoration to health. In a rickety skeleton all the bones are found to be stunted in growth, and this combined with the bending of the lower limbs, which must necessarily detract from the height of the individual, is the cause of the short stature of persons who, when young, have been subject to this disease. The arrest of growth affects some bones more than others, being principally noticeable in the bones of the face, of the lower limbs, and of the pelvis. As it affects the pelvis the want of growth is very important from its influence upon child-bearing in after life. In the child the size of the pelvis and lower limbs is small in proportion to the rest of the body; in the adult female it has so increased as to be relatively larger than the other parts of the bony framework. If then the growth and development of the pelvis are arrested, its brim and outlet do not undergo the usual expansion, but remain small and contracted, retaining the characters of the infantile pelvis. The obstacle to the passage of the fœtal head, under such circumstances, becomes extreme, especially if conjoined with deformities produced by softened bone, and usually requires craniotomy or embryotomy before the child can be extracted. This condition of the pelvis may also interfere with operations upon the child, as in the case of lithotomy already referred to. According to Mr. Shaw, there is a correspondence between the degree to which the pelvis suffers from this arrest of growth and development, and the degree to which the lower limbs suffer from the same causes; we can therefore by observing the amount of stunting of the lower limbs make some estimate of the extent to which the pelvis is likely to be modified in size and capacity.

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[1] *Loco citato*, p. 262.

[2] See two papers, by Mr. Shaw, published in the Transactions of the Med.-Chir. Society, vols. xvii. and xxvi.

The *articulations.*—As the ends of the long bones are enlarged the joints into which these bones enter must necessarily be enlarged also. They have therefore a knotted, bulbous look, an appearance which is aggravated by the atrophy of the muscles of the limb. In addition to this the ligaments which hold the bones together are relaxed: the joints are therefore loose and unsteady, and can be moved freely in directions which, in a healthy state, would be impossible. This looseness and mobility of the joints forms alone a great impediment to walking, even should the bones themselves be healthy, and in fact the relaxation of the ligaments does not always bear a due proportion to the osseous changes. It is often an early symptom, and we frequently see it carried to a high degree in cases where the disease in the bones is as yet comparatively trifling. In these cases, if we hold the child upright, so that the weight of the body rests upon the feet, we see that each lower limb forms an obtuse angle at the knee; the knees touch; the legs are directed outwards; and the foot is more or less everted from relaxation of the ligaments of the ankle. In children in whom the disease appears at, or after, the end of the second year, this weakness in the joints is a very prominent symptom, and is often found where the limbs are perfectly straight and well formed.

All the joints in the body are sharers in this ligamentous weakness, for it is not confined to the articulations of the limbs. The fibrous bands which connect the vertebræ with each other and with the sacrum, the sacrum with the pelvis, are alike affected; and it is a conjunction of all these various lesions, combined with the softening of the bones, and the weakness of the muscles, which produces the inability to walk, and the difficulty of holding the body upright, which are so characteristic of the disease.

The general symptoms continue while these changes are going on. The perspiration is profuse, and the tenderness increases in proportion to the softening of the bones. The appetite may remain ravenous, but more often it diminishes, and the child shows a disgust for food, or only exhibits a craving for beer, and the more tasty articles of diet. Sickness frequently occurs at this time, for attacks of gastric derangement often complicate the disease, and aggravate it. In these cases there is a sour smell from the breath, the vomited matters are acid, the bowels either become constipated, or there is diarrhœa with green, slimy, offensive stools, showing the participation of the intestinal mucous tract in the derangement.

The emaciation increases; the fat disappears, and the muscles get more and more flabby and wasted. The loss of power in the muscles is, however, as Sir W. Jenner has pointed out, greater than can be accounted for by the wasting; and if the disease be severe, the child may be incapable of supporting himself in the slightest degree.

The face gets old-looking; the eyes are large and staring, but somewhat deficient in speculation; and the general expression is placid, although rather languid. The respiration is quick and laborious, and if there be much softening of the ribs, and consequent recession of the chest walls, the child's whole faculties appear to be concentrated upon the performance of the respiratory act. "He strives," to use Sir W. Jenner's words, "with all the energy he has to keep in constant action every one of his muscles of respiration, endeavouring so to supply the mechanical defects of his respiratory apparatus due to the softening of the ribs." Such a child will give little trouble to his attendants; in fact, the little creature has no breath to spare for idle lamentations, and cannot afford to cry.

The abdomen is very large, and often appears enormously distended when compared with the narrowed and distorted chest. This enlargement of the belly is due to depression of the diaphragm and diminished capacity of the thorax, which force down the liver and spleen below the level of the ribs; to increased shallowness of the pelvis; to the flabby condition of the abdominal muscles favouring the accumulation of flatus generated by the digestive derangement; and in some cases to actual increase in size of the liver and spleen.

The enlargement of the liver and spleen, when it occurs, is usually combined with enlargement and induration of the lymphatic glands all over the body. The superficial glands may be felt in the groins, the armpits, and the sides of the neck, as hard, round, freely movable bodies, varying in size from a pin's head to a sweet-pea. The size of the spleen may be greatly increased: the liver, however, is seldom much enlarged, but its edges are harder and sharper than in health. There is at the same time extreme emaciation and anæmia, with often a little anasarca, so that the child has the peculiar "waxy, greenish-yellow tint which is sometimes seen in the anæmia of young women."[1] The œdema is sometimes general and decided;

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[1] Jenner, Medical Times and Gazette, May 12, 1860, p. 435.

but there is never any increase in the white corpuscles of the blood.

With regard to the intellect, most writers have declared that it is precocious. Sir W. Jenner, however, opposes this view. "Children, the subjects of extreme rickets, are almost always deficient in intellectual capacity and power. They are not idiots; they show no signs of idiocy; they resemble rather children of low intellectual capacity and power much younger than themselves." He explains the source of the error by the fact, that rickety children separated in consequence of their physical defects from other children, are necessarily thrown very much into the society of adults, and therefore catch "their tricks of expression, their phrases, and even some, perhaps, of their ideas." These children are also very late in talking. They appear to be incapable of picking up new words with the readiness exhibited by healthy children of ordinary cleverness.

Apart from all the physical changes produced by the disease, the behaviour of a rickety child is very characteristic, and is of itself almost sufficient to warrant a diagnosis. The quiet, the repose, about him, strike the observer at once. Such a child if able to support himself, will sit for hours, his legs stretched out straight before him on the floor, perfectly contented if only allowed to remain unnoticed. All that he wants is to be let alone. A healthy child delights in movement; a rickety child is only happy when at rest: his greatest pleasure consists in inaction. To look at him we are irresistibly reminded of the other term of life, for he appears to have anticipated at least one consequence of the weight of years, and to have combined the patient endurance of old age with the face and figure of a child.

Complications.—The state of extreme debility to which a child suffering from advanced rickets is reduced naturally favours the occurrence of secondary diseases in general; and it is usually to one of these that death is to be directly attributed, although, in some cases, the intensity of the general disease may be of itself sufficient to carry off the patient. Measles, whooping-cough, and scarlatina, are very liable to occur, and to prove fatal; but there are certain other diseases which are especially predisposed to by rickets, viz.:—

Catarrh and bronchitis.
Diarrhœa.
Laryngismus stridulus.
Convulsions.
Chronic hydrocephalus.

To *catarrh* and *bronchitis* are due a very large proportion of the deaths in this disease, and Sir W. Jenner[1] explains very fully the cause of this great mortality.

At all ages bronchitis is an extremely fatal disease. The mucus which is thrown into the tubes impedes the entrance of air; but unless air can enter freely into the vesicular structure of the lung, mucus cannot be expelled. In coughing to expel the mucus, the lung must be filled with air to the utmost; the contained air is then prevented from escaping by closure of the glottis, and, at the same time, pressure is brought to bear upon the lungs by the muscles of expiration. The glottis is then suddenly opened, and the air is driven out, carrying with it the mucus which obstructed the tubes. The forced respiration seen in persons suffering from bronchitis, is merely the effort made to draw in the air past the obstructing mucus. A second impediment to the entrance of air into the lung is found also in the healthy child. It arises from the natural flexibility of the lower part of the thoracic parietes which yield to a certain extent in inspiration before the pressure of the external air. In advanced rickets, however, this natural flexibility is greatly increased by the abnormal softening of the ribs, so that even when the lungs are healthy each inspiration is only effected by a distinct laborious effort. Now add bronchitis to this condition, and the impediment is extreme. Air cannot enter deeply into the lungs; mucus cannot be expelled; the air, however, in the lungs, can be, and is expelled; there is, consequently, collapse, and the child dies —not properly speaking from the collapse, but from that which caused the collapse, viz., the inability of the inspired air to pass the obstructing mucus.

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[1] Medical Times and Gazette, April 7, 1860, p. 335.

The extent to which the ribs are softened, and the amount of their recession in inspiration, are therefore of extreme importance as regards the prognosis of bronchitis when it occurs in rickety children.

Diarrhœa.—Rickety children are especially liable to attacks of purging. This may be accounted for partly by their extreme sensitiveness to changes of temperature, and partly by the unhealthy condition of the alimentary canal, which always precedes and accompanies the disease, and which a very slight additional irritation would easily aggravate into diarrhœa. These attacks are exceedingly dangerous. We know that even healthy children, seized with profuse purging, rapidly lose flesh, and soon become exhausted. A few hours are sufficient, if the drain is severe, to cause a marked change in their appearance; their features quickly lose the roundness of youth, and assume instead the pinched, drawn characters of age. Rickety children, already enfeebled, are still less able to withstand the depressing effects of the disorder, and fall victims to it all the more readily in proportion to the degree to which their strength has been previously reduced.

Laryngismus stridulus and *convulsions* are very common complications of rickets. The first especially is almost always associated with rickets as its cause. Sir W. Jenner[1] has only known two cases of laryngismus to occur in children not the subjects of that disease.

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[1] Medical Times and Gazette, May 12, 1860, p. 465.

Whether it is, as Dr. Gee suggests,[1] that the convulsive tendency and the rickety state are both due to the same condition of general malnutrition, or that the convulsions are a secondary result of the rickety constitution, the fact remains that in rickets the special and the general convulsive attacks are exceedingly frequent, and are often combined. Out of fifty cases of laryngismus noted by Dr. Gee, forty-eight were rickety, and of these nineteen had general convulsion. Out of one hundred and two children in whom general convulsion occurred, forty-six were rickety. This connection is exceedingly important, as regards the treatment of these attacks. Most of the children in whom this convulsive tendency is marked have carpo-pedal contractions.

As dentition is backward in all these cases, the laryngismus and the convulsions are frequently attributed to teething. The teeth, however, are quite innocent of any share in the production of these complications. They are backward as a consequence of the arrest of growth of bone which is one of the characteristics of the disease. When the teeth do appear they are often cut with remarkable ease, and whereas the child had been formerly subject to convulsions, with or without apparent cause, the commencement of dentition is accompanied by no such phenomena; the removal of the rickety condition, as shown by the evolution of the teeth, being coincident with the disappearance of the spasmodic tendency.

Chronic hydrocephalus occasionally complicates the disease, and is most common, according to Dr. Merei,[2] between the ages of eight and eighteen months. The fluid may be in the lateral ventricles, in the arachnoid sac, or in both.[3] It often appears to be a merely mechanical effusion, the serosity being thrown out to fill up the space left when the cranial cavity becomes enlarged without any corresponding increase in the size of the brain. In these cases the convolutions are perfectly natural, and show no signs of pressure.

On account of the altered shape of the skull, hydrocephalus is often suspected where it does not really exist. The differences between the ordinary rickety head, and the skull expanded by fluid in its cavity, have already been pointed out. (See page 78.)

Besides the complications which have been mentioned, tubercular formation may occur in rickety children. This, however is not a special complication of the disease, and is comparatively rare.

When death results from the intensity of the general disease, without the occurrence of any of these complications, the child becomes weaker and weaker; he loses all power of supporting himself, and can hardly move. The difficulty of respiration, owing to the softened state of his ribs, absorbs all his attention. The face gets livid, or leaden-coloured; the perspirations are extreme; the tenderness is so great that he cannot bear to be touched; the softening of the bones, and the consequent deformities, continue, although sometimes the bones seem to get brittle, and fractures may occur unless the child is moved with very great care. The appetite becomes completely lost; the body generally is much wasted, although the belly remains full and distended; and at last the child dies exhausted or asphyxiated.

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[1] See an elaborate paper by Dr. Gee in St. Bartholomew's Hospital Reports, vol. iii. 1867.

[2] Disorders of Infantile Development and Rickets, 8vo., 1855.

[3] Dr Gee, *loc. cit.*

If the disease terminates favourably, the symptoms gradually subside, and finally disappear. The tenderness becomes less marked; the bones cease to soften; the child appears more lively, and takes an interest in what passes around him. As the softening of the ribs diminishes, his respiration grows less laborious, and he will then begin to amuse himself with his toys. The appetite improves, and gets less capricious; the bowels are more regular, and the stools healthier-looking. The wasting ceases; the child begins to gain flesh, while the belly decreases in size, and becomes less prominent. The head-sweats are less noticed, and his sleep at night is more tranquil, although for a long time he will continue to throw off the bedclothes at night unless restrained. Dentition recommences, and goes on rapidly and easily.

The deformities of the bones gradually diminish; the bones get very much straighter than would be expected from their former distortion, and become exceedingly thick and strong. The muscles also begin to be more developed, and increase rapidly in size. The increase in length of the bones, however, is not rapid, and the child remains more or less stunted, seldom when full grown reaching the average height.

Pathology.—Rickets is a general disease, and affects very widely the tissues of the body. Its influence is most manifest in the bones, which are always implicated, but we find in addition, changes in the brain, liver, lymphatic glands, spleen, muscles, and often of every organ in the body.

Rickets affects the bones in three different ways.

It interferes with their growth, not only temporarily, but permanently; for children who have been thus affected never, as Mr. Shaw has pointed out, grow into average sized adults.

It interferes with their development, perverting the process of ossification, and rendering the calcareous deposit irregular and incomplete. Indeed, according to Sir W. Jenner,[1] it is not true ossification at all, but rather petrifaction, such as we see occasionally taking place in enchondromata.

But besides its influence over the growth and development of bone, rickets produces equally serious changes in bone already completely ossified. It softens and consumes the osseous tissue, so that the bones lose in density, in weight, and in firmness; they yield under the pressure of a finger, and can be cut "like carrots with a knife."[1] This softening is due to the removal of the lime salts, which enter the blood in a soluble form, and are excreted by the kidneys. Some pathologists have attempted to explain this absorption of lime by the excessive formation in the alimentary canal of an acid which has been variously stated as lactic, oxalic, phosphoric, and hydrochloric. The acid, whatever it may be, enters the blood, and so assists in the abduction of lime from the bones. This, however, is mere hypothesis. Some change probably takes place besides the loss of the earthy matter of the bones, for in some of Lehman's and Marchand's experiments the bones yielded no gelatin on boiling.

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[1] Medical Times and Gazette, March 17, 1860, p. 261.

Anatomical Characters.—The enlargement of the ends of the long bones is a real hypertrophy. "In rickets," says Sir W. Jenner, "there is an exaggeration of the conditions we find in the first stages of ossification in the healthy subject; the completion of the process only is stayed. There is great development of the spongy tissue of the head of the bone, and of the epiphysis, and also of that layer of cartilage in which the primary deposit of calcareous matter takes place. The layer of cartilage in which the cells are arranged in linear series, instead of being half a line, is from a quarter to half an inch in breadth."[2] While, however, great preparations are thus made for the process of ossification, the performance of that process is extremely irregular and inadequate. The advancing bone, instead of moving up in a regular line into the cartilage, consolidating as it advances, as we see in normal ossification, strikes up at different points, leaving the cartilage at other points still uncalcified, and these may remain untouched far below, forming specks of cartilage completely surrounded by bone. In addition to this, the cartilage cells become ossified before the matrix, being converted into lacunæ and imperfect canaliculi. "This takes place," says Kölliker, "by a thickening of the wall, and, at the same time, a formation in it of canalicular cavities," so that at last a vacant space resembling an almost perfect lacuna is all that is left of the cavity of the cell. The usual deposition of granular calcareous particles is absent from the matrix at the border of ossification; the changes in the cartilage cell can therefore be more distinctly observed.

According to Virchow the abnormal condition of rickety bone consists "not in a process of softening of the old bone, but in the non-solidification of the layers of new bone are as they form." The old layers of bone are consumed by the formation of medullary spaces in the normal manner, and the new layers which are formed remain soft. Isolated masses of lime are also scattered about in sufficient numbers to give a dotted appearance to a section of the cartilage, and—to add to all the other irregularities—we find medullary spaces, not only just below the margin of calcification—where they ought to be—but also far beyond the border of calcification—where they ought not to be; and these spaces are filled with a soft slightly fibrous tissue, with vessels running up into them.

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[1] Trousseau, Clinique Médicale.

[2] Medical Times and Gazette, March 17, 1860, p. 261.

Changes also take place in the flat bones, and in the shafts of the long bones. On section we see that the meshes of the spongy tissue are dilated, and that the cavities are filled with a greasy, gelatinous, bloody matter, looking, says Trousseau,[1] "like pale red gooseberry jam." This pulp contains colourless nucleated cells, with one, or sometimes two, nuclei, a few blood-corpuscles, and a large quantity of free fat. The periosteum is a bright rose-colour from injection with blood, thicker than natural, and intimately adherent to the bone which is itself more vascular and less polished-looking than it ought to be. The pulp fills up the diploë of the flat bones, and in the shaft of the long bones is found filling the medullary canal and the meshes of the cancellated tissue, and separates the lamellæ of the more compact part from one another. At the same time the tissue itself becomes softer.

As the disease advances the outer and inner tables of the flat bones become thin, soft, and elastic, so as to yield under the pressure of the fingers. The bones have a bluish appearance from the colour of the pulp which fills up their diploë being seen through the semi-transparent bony shell. The periosteum now increases in thickness, and, according to M. Guérin,[2] a red gelatinous matter, similar to that which clogs the diploë and the meshes of the cancellated tissue is deposited between it and the body of the bone. This gelatinous matter gradually thickens and acquires the consistence of cartilage, while at the same time the porosity of the bone is increased, the old tissue being gradually removed by interstitial absorption. The gelatinous matter lying beneath the periosteum is intimately adherent to it, coming away with it when that membrane is detached. "It is evidently," says Trousseau, "a product of periosteal secretion," and the process of its formation is analogous to what takes place in the production of callus thrown out to unite healthy bone after fracture; it resembles callus also in its power of becoming transformed into bony tissue much more solid and dense than the old bone. The medullary canal is narrowed by the thickening of its lining membrane, and by the deposit of matter like that which fills up the cancellar spaces. This narrowing is best marked at the most pronounced part of the curve, and should the curving be extreme, the canal may end abruptly at this point, opening externally under the periosteum. It would thus form an obtuse angle with the other part, from which it has been separated by the new tissue formed in the hollow of the curve. These curvatures in the shafts of the bones are incomplete fractures, such as take place in bending forcibly a stick of green wood.

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[1] Clinique Médicale.

[2] Mémoire sur le Rachitis. Paris, 1857.

So long as the disease is in progress the bones lose more and more of their firmness, getting softer and softer, so that they yield before the slightest pressure—either the pressure of the air, as in the distortions of the ribs, or the weight of the body, as is the case with the limbs. When, however, the disease becomes arrested, consolidation commences, and the bones acquire greater firmness and consistency. The process of consolidation is compared by Trousseau[1] to the calcification of callus in ordinary fractures. In the long bones calcareous nuclei, the rudiments of new bony tissue, appear in the greasy gelatinous matter deposited beneath the periosteum at the circumference of the shaft. These enlarge and unite; the layers of bone get thicker and thicker; and the new tissue, thus acquiring consistence, hardens gradually into a compact substance like ivory. In the flat and short bones the effused matter is partially absorbed, so as to restore the normal spongy tissue. According to Dr. Vogel,[2] the occipital bone sometimes differs from the other bones of the skull in the changes which it undergoes. In the condition called cranio-tabes, which has already been described, spots are found in this bone where the osseous tissue is thin, transparent, of a yellowish-red colour, and contains scarcely any spongy substance. By holding the bone against the light the extent of the thinning can be readily seen. When looked at from the inside, depressions are found which correspond to the underlying convolutions of the brain. Dr. Vogel divides the process by which these changes take place into two stages: a first stage, in which there is deficient deposition of phosphates in the external bony layers all over the skull; and a second stage, in which absorption takes place in the softened parts where the pressure of the brain is felt.

Sometimes the thinning of the bone is so extreme that the osseous tissue almost entirely disappears in the affected spots; the pericranium and the dura mater then come into contact, having between them merely relics of bone still unabsorbed.

From the result of different analyses that have been made of rickety bone, it appears that the bone contains 79 parts of organic to 21 of inorganic matter; thus differing very much from the proportions found in healthy bone, where the inorganic matters are largely in excess of the organic, being as 63 to 37.

The animal matter of rickety bone yields no gelatin on boiling, and at an advanced period of the disease, is said by Simon to yield neither gelatin nor chondrin. Schlonberger and Friedleben have obtained perfect gluten from rickety bone.[3]

The softening of the ribs, and consequent deformity of the chest, produce certain morbid conditions in the contents of the thoracic cavity. The influence exercised by the softened ribs upon the course and termination of bronchitis, has already been described; but there are, besides, two special lesions of the lung, which are invariably present, and always in the same situation in every case of rickety chest-distortion. These lesions are emphysema and collapse.

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[1] *Loc. cit.*

[2] Lehrbuch der Kinderkrankheiten, von Dr. Alfred Vogel. Erlangen, 1863.

[3] Reynolds' System of Medicine. Art. "Rickets," by Dr. Aitken.

The emphysema occupies the whole length of the anterior border of each lung, extending backwards for about three-quarters of an inch from the free margin. Sir W. Jenner[1] has explained the mode of its production in the following way. At each inspiration the ribs sink in, and the lateral diameter of the chest is narrowed at the part corresponding to the line of union of the ribs with their cartilages. While, however, the lateral diameter is thus diminished, the antero-posterior diameter is increased by the thrusting forwards of the sternum. Air, therefore, is forced in excess into the lungs at that part so as to fill up the resulting space, and over-distension of the air vesicles is the result.

Collapse of the lung is produced by the recession of the ribs during inspiration. The collapsed portion forms a groove just outside the emphysematous part, separating it from the healthy lung. This groove corresponds to the line of nodules which represent the enlarged ends of the ribs and which project inwards into the interior as much as, or even more than, they project exteriorly. During inspiration the ribs sink in, and the nodules are forced against the lung, beneath them, so that they compress the pulmonary lobules at those points, and close them against the advancing air.

These two lesions are, therefore, quite independent one of another; and although they invariably occur if there is much softening of the ribs, yet they do not stand to one another in the relation of cause and effect.

The collapse which is sometimes found to occupy the posterior and inferior parts of the lung, and occasionally some parts of the upper lobes, is the result of plugging of a tube with mucus. The mechanism of this has already been described. It is only found in bronchitis.

Another result of the rickety chest is the circumscribed opacity on the visceral surface of the pericardium, known by the name of "white patch." This, although uncommon in children generally, is very common in rickety children. Its seat is usually the left ventricle, a little above its apex, just at the point where the heart at each beat comes in contact with the nodule of the fifth rib. In this case friction against the bone is evidently the cause of the white patch, and this is a strong argument in favour of the "attrition theory" generally. The same thing is often seen on the spleen, which, rising and falling with respiration, is rubbed against a projecting rib nodule. It is distinguished from the result of embolism by not extending deeper than the fibrous coating of the organ.

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[1] Medical Times and Gazette, April 7, 1860, p. 335.

The pathological changes which take place as a result of rickets in the lymphatic glands, liver, spleen, and other internal organs, have also been described by Sir W. Jenner.[1] They appear to be all of them affected with the same condition, which Sir W. Jenner calls albuminoid degeneration, and which corresponds very much to Virchow's amyloid degeneration, differing from it only in not giving the characteristic mahogany-brown colour on the addition of a solution of iodine.

All the organs on section show a pale, transparent uniform surface; they are tough and solid to the feel, and are heavy out of proportion to their size. They are not all of them enlarged; the liver and lymphatic glands are seldom much increased in size; but whether enlarged or not, they exhibit the other peculiarities which have been described. This albuminoid degeneration is not found in all cases of rickets; it is limited to those cases where the emaciation is marked; but where it does occur, Sir W. Jenner believes all the organs to be alike affected by it, and not merely one or two.

The spleen varies very much in size. Sometimes it can just be felt below the ribs; sometimes it is very much enlarged. It may measure as much as eight inches from above downwards, and four inches from side to side. "Its substance," says Sir W. Jenner, "is tough and elastic, and the thinnest sections can be cut with facility. The cut surface is remarkably transparent and smooth. It is not unlike what one might suppose would be its appearance if the whole organ were infiltrated with glue. Only a little pale blood can be expressed from the cut surface. Usually the organ is pale red, but occasionally it is dark purple. The more transparent any given part is, the paler it is; the more transparent parts are almost colourless. The splenic corpuscles are sometimes more readily seen than in a healthy spleen; they may be mistaken for gray tubercles. I have never seen in the spleen of rickety children, the sago-like little masses so often present in the spleens of those who die of phthisis."[2]

The thymus gland is often enlarged, and exhibits on section the usual pale transparent look from infiltration with the same albuminoid substance as the other internal organs.

The brain is usually larger than natural, and may also present the signs of albuminoid degeneration. Sometimes, however, this appearance is not seen, the increase being apparently due to a true hypertrophy. In a case noted by Dr. Gee,[3] this organ weighed fifty-nine ounces; it was of natural consistence, not toughened or hardened, and the gray and white matter appeared to retain their normal proportions. In another case, the brain weighed forty-two and a half ounces, and also seemed healthy, although of such unusual size.

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[1] *Loc. cit.*

[2] Medical Times and Gazette, April 7, 1860, p. 336.

[3] Saint Bartholomew's Hospital Reports, vol. iii., 1857.

The voluntary muscles are small, pale, flabby, and soft, but do not owe this appearance to fatty degeneration. Sir W. Jenner did not succeed in detecting a single particle of olein in their fibres. Under the microscope their fibres are "singularly colourless, transparent, and soft," with the striæ very indistinctly marked.

The urine in rickets is pale. The amount of urea and uric acid is diminished; but there is increase in the amount of the earthy phosphates. This increase is stated to be greatest at the beginning of the bone-softening, and to become less marked when the disease is further advanced, and the bones are undergoing distortion. Free phosphoric and lactic acids have been observed, and it is not uncommon to find a sediment of oxalate of lime. Phosphate of lime was in great excess in a case recorded by Mr. Solly.

Diagnosis.—The early diagnosis of rickets is of great importance: few diseases are so readily curable in their early stages, or so fatal if allowed to continue unchecked. Plumpness is no proof of the absence of rickets, for a child may be extremely fat, and yet rickety: on the other hand, wasting is no proof of its presence, for a child may be reduced almost to a skeleton without presenting a single symptom of the disease.

In a well-marked case of rickets the head elongated from before backwards; the square, straight, prominent forehead; the small face; the beaded ribs; the deformed chest; the tumid belly; the twisted, distorted limbs; the immobility and quiet of the little creature as he sits—if he *can* sit—with bowed spine and head thrown back, gazing around him with vacant eyes; all these characteristic symptoms leave no room for doubt as to the nature of the disease.

It is only when the disorder is at its very commencement, or appears first about the end of the second year, that it is so liable to be overlooked. A mild form of rickets, consisting merely in a little enlargement of the wrists and ankles, slight beading of the ribs, arrested or late dentition, and a large fontanelle, is exceedingly common, even in wealthy families. The parents from these signs alone never suspect disease, and indeed the plumpness of the child, which is often very considerable, is the subject of much admiration. The absence of teeth is looked upon as an innocent peculiarity, and cases are quoted of relations, male and female, in whom the same tardy dentition was observed. It is not until some complication arises, or the disease enters a new phase, that anything is noticed to excite alarm. But late cutting of the teeth is never a natural condition. If, as Sir W. Jenner has observed,[1] the ninth month passes away without the appearance of a tooth, the cause should be carefully inquired for, and will almost always be found in rickets.

Lateness in walking much more frequently attracts the attention of parents, and children are often brought for advice on account of "weakness in the legs." In these cases, owing to the inability of the child to support himself, even for a moment, when held upon his feet, essential paralysis may be suspected. An examination, however, will show that although there is no power of standing, yet power of movement is by no means lost. The child draws up the legs when the soles of the feet are tickled, and the muscles, although weak, are not absolutely powerless. Other symptoms of rickets are also present.

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[1] Medical Times and Gazette, April 7, 1860, p. 334.

When the want of muscular power has increased to such a degree that the child is incapable of movement, the incapacity is general, and is not confined to one or more limbs. Besides, at this stage the deformities of bone are usually well marked, and the chest distortion is very great.

Relaxation of the ligaments, and consequent unnatural mobility of the joints, are almost always due to rickets. They are common results of the disease when it occurs after the end of the second year, and may be present although there is no osseous deformity, and very little enlargement of the ends of the bones. All the articulations are affected, but the knees and ankles seem to suffer most, as they bear the weight of the body. The yielding of the ligaments of these joints may be so great as to make walking difficult or even impossible, but where the relaxation is extreme there is usually combined with it more or less softening and distortion of the bones.

In rickety children, before cutting for stone, the size of the pelvis should be carefully studied, for narrowness of the outlet may create great difficulty in removing the calculus. By noting the degree of stunting and distortion of the lower limbs, a fair guess may be made as to the degree to which the pelvis is likely to have suffered from arrest of development and softening of its bones. An examination *per anum* will, however, at once remove any doubts: by the finger introduced into the rectum we can readily explore the entire pelvic cavity, and the size and capacity both of the brim and of the outlet can by this means be satisfactorily ascertained.

Mollities ossium, which has been called the rickets of adults, appears to be a completely different disease; it goes on always from bad to worse; re-ossification never takes place; and it induces fatty degeneration of the bones—a condition never found in rickets.

Prognosis.—The danger of rickets lies principally in the complications. As long as the disease remains simple, and the bone-softening is not extreme, the prognosis is very favourable.

In estimating the danger of any particular case, attention should always be paid to two points:—

1. The amount of chest distortion.
2. The presence or absence of albuminoid degeneration of the spleen, and glandular system generally.

1. If the chest is much distorted, and the softening of the ribs is great, there is always cause for anxiety. Owing to the difficulty of respiration in these cases, there is deficient aëration of the blood

(shown by the lividity of the lower eyelid and of the mouth), and consequent deficient oxidation and removal of waste matter. The slightest catarrh, as has been before explained (see p. 86), adds a further obstacle to due aëration; and catarrhs are always liable to occur, however carefully chills may be guarded against, owing to the extreme sensitiveness of a rickety child to changes of temperature. Under such circumstances the child's life is always in danger, for a slight cold, which in a healthy child would be scarcely worth notice, or which would be easily treated by domestic remedies, will be sufficient in a rickety child to cause fatal collapse of the lungs. If a child, the subject of this disease, begins to cough, no prognosis should be hazarded until the movements of the chest during respiration have been carefully watched; and here more useful information can often be gained by the eye than by the stethoscope. The danger is in direct proportion to the degree of recession of the ribs during inspiration.

2. The danger of albuminoid degeneration of the glandular system is shown by the emaciation with which it is always accompanied. The weakness of the child in these cases reaches its height, and the impediment to the proper elaboration of nutritive material set up by such a condition of the glands forms a great obstacle to efficient treatment. These cases are usually fatal.

On account of the danger of catarrh, those disorders in which it is a prominent symptom are of course especially formidable to rickety children. On this account measles and whooping-cough are greatly to be dreaded.

Of the other complications, diarrhœa is the most serious. Convulsions are not necessarily fatal, although they increase the gravity of the case. Sometimes, though rarely, laryngismus stridulus causes death.

The combination of hydrocephalus with rickets is seldom attended with danger.

No indication for prognosis can be derived from the age of the child. A slight degree of rickets is very common in infants of seven months old, and, when the causes which produced it are removed, it ceases as readily in them as in older children. The severity of the disease depends upon the intensity and the continuance of the causes of which it is the result.

Causes.—Rickets is usually ranked amongst the diathetic diseases of childhood, but its claims to such a position are by no means indisputable. A diathesis is defined by Dr. Aitken,[1] as "that character of the constitution which tends to the repeated expression of some form of ill-health, always in the same way." In other words, it is a constitutional predisposition to repeated manifestations of a certain invariable form of disease. Now, in rickets there is, strictly speaking, no constitutional predisposition. It is the result of certain known causes, without which the disease cannot be produced but under the influence of which any child whatever (with certain exceptions, to be afterwards noticed) will become rickety. That the disease occurs amongst the children of the rich as well as amongst the poor is no argument against this view, for wealth cannot buy judgment, and education is no guarantee against foolish indulgence. We know that a child may be in reality starving, although fed every day upon the richest food, for he is nourished, not in proportion to the nutritive properties of the food he swallows, but in proportion to his capability of digesting what is given to him. If, therefore, he be supplied with food unsuited to his age, the result is the same, whether he live in a palace or a cottage.

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[1] Science and Practice of Medicine, by W. Aitken, M. D., Edinburgh, 2d edition, 1863, vol. i. p. 212.

Cases occasionally occur where the mother, exhausted by chronic disease, or other depressing cause, bears children feeble at their birth, and who very rapidly become rickety. But these are not true cases of constitutional predisposition. The child is born suffering already from the effects of deficient nutrition in the womb. He is then at once suckled with poor watery milk, or is brought up by hand and stuffed with all the hurtful trash with which the ignorance of mothers prompts them to supply the deficiencies of their milk. The natural result of such imperfect nourishment follows, and rickets declares itself. But here the child can only be said to have been predisposed to rickets in the sense that he was born suffering from a condition of which rickets is the final and most striking stage. Rickets does not produce malnutrition, but malnutrition produces rickets. The infant is not born weakly because he has a rickety predisposition, but he falls a victim to rickets because he was born weakly.

It occasionally happens that a child is born suffering from the catarrh of whooping-cough, but he cannot be said to have a constitutional predisposition to pertussis because after the lapse of a certain time he begins to whoop. The disease was present at birth, although it had not at that time reached the spasmodic stage. So also in the case of early rickets, the disease really began in the womb, and only underwent further development after the entrance of the child into the world.

Besides, for the full development of the disease it is essential that the same causes by which nutrition was first rendered defective should continue in operation. If measures are taken to improve nutrition, this result does not follow, for when well cared for, and supplied with proper nourishment, the child in all cases becomes strong and healthy. Rickets is no disease which *must* run its course. By judicious treatment it may be stayed at any point of its career; and the treatment required is merely food—food which nourishes, and drugs which are not so much medicines as food under another name.

Again, in the true diathetic diseases of children, as tubercle and syphilis, hereditary tendency plays a very important part, but in the case of rickets there is very little evidence of such a cause. Out of the thousands of rickety children there will no doubt be many, one or the other of whose parents was rickety before them; but the same thing may be said of any other common disorder. It is always difficult where many conditions unite in the causation of a disease to separate the share which hereditary tendency takes in its production, but no special facts have yet been brought forward to show that rickety parents are more likely to have rickety children than parents who have been altogether free from the disease—the other conditions remaining the same.

Rickets, then, is not a diathetic disease in the sense in which tuberculosis and syphilis are diathetic diseases. Before the alterations in structure actually occur there is nothing in the appearance of the child to indicate the disease from which he is about to suffer. It is acquired under the influence of certain causes, lasts as long as those causes continue in operation, and, unless the structural changes are so extensive, and the general strength so reduced, as to forbid recovery, passes off when the causes are removed.

These causes must be look for in all those conditions which interfere with the proper nutrition of the child. Ill health or weak constitution of the mother affecting the nutrition of the fœtus in utero, and after birth of the child deteriorating the quality of the breast milk; improper feeding generally, ill-ventilated rooms, damp, cold, dirt, want of sunlight, want of exercise. The continued influence of these causes will produce the disease, or rather, will produce that unhealthy condition of the body of which rickets is the direct consequence. The preliminary stage, that which marks the commencement and progress of malnutrition, and in which the strength is being gradually reduced to the point at which rickets begins, may be long or short according to the degree of vigour of the child, and the degree of intensity with which the causes operate, or may even be absent altogether. Its place may be taken by any disease which interferes seriously with the assimilative power, and causes sufficient impairment of the general strength. We thus get another set of causes, which may either act independently of the others, or may most powerfully intensify their influence. Thus rapidly recurring attacks of diarrhœa, chronic vomiting, measles, bronchitis, broncho-pneumonia, in fact, all the exhausting diseases, may have this effect.

Too early weaning is sometimes stated to be a special cause of the disease. It is no doubt true that to deprive a young child of breast milk which he can digest, and to supply him instead with food which he cannot digest, is certain to be hurtful. In England, however, the tendency is rather to keep the child too long at the breast, to accustom him to look to that for his sole nourishment after the time when some additional food is required. In either cases the supply of nutritive material is equally deficient, and the effect upon the health of the child must be equally unfavourable.

The connection between syphilis and rickets is interesting; by some writers great importance is attributed to the influence of the former disease as a cause of rickets, while others have denied such influence altogether. That syphilitic infants do occasionally become rickety, no one who has been a close observer of children's diseases can venture to doubt. A child may become the subject of rickets after the disappearance of the syphilitic symptoms, or even while the body is yet covered by the specific rash. Such cases are, however, the exception, and are usually mild. I have never as yet met with an example of severe rickets occurring in a syphilitic child.

With regard to the influence of tubercle, rickety children may become tubercular, and a phthisical mother may bear rickety children; but a child in whom the tubercular diathesis is marked, never, I think, becomes rickety. It is also rare to find a case of rickets occurring in a family the other children of which are the subjects of tuberculosis.

Prevention.—If any of the former children of the family have been rickety, especial attention must be paid to the diet and general management of the new-born babe. The mother may still suckle the infant during the first month, but after that time she should give up all idea of rearing the child from her own breast, and a wet-nurse should be provided. If from circumstances this is impossible, the breast-milk must be limited to two meals a day; the child being fed at other times upon ass's milk or cow's milk and lime-water, as recommended in an earlier part of this volume. At the same time, all the other precautions so essential to perfect health must be carefully observed. Perfect cleanliness, warm clothing, fresh air, well-ventilated rooms, sunlight, are all indispensable. If the parents reside in a cold damp situation, the child should, if possible be removed to a neighbourhood where the quality of the air is drier and more bracing. For full particulars as to the best method of preventing the occurrence of rickets the reader is referred to the section on the treatment of simple atrophy. If the management of the child is conducted according to the rules there laid down, rickets cannot occur, for the causes which produce the disease will not be in operation.

Treatment.—In the treatment of rickets, our first care must be to endeavour to restore healthy nutrition. This can only be done by attention to diet and to general hygiene, taking care at the same time to correct any disordered condition of the alimentary canal which may be present to interfere with the proper digestion and assimilation of the food supplied. This is indispensable as a first step, for to give tonics while the causes which have produced the disease, and sustain it, continue in operation, is a course which cannot possibly be attended with any good result.

The diet of the child must be regulated to suit the degree of debility to which he may be reduced, remembering that the greater his weakness, the more nearly does his digestive power resemble in degree that of a new-born infant. Full directions about diet have already been given in a former chapter (see Treatment of Simple Atrophy), and need not here be repeated. The stomach and bowels must also be attended to according to the rules laid down in the same section.

Plenty of fresh air is indispensable to the successful treatment of rickets. The child should be taken out regularly into the open air, and as he gets gradually stronger should pass more and more of his time out of doors. The quality of the air is of much importance, and sea-side places where the air is dry and bracing, as Lowestoft, Scarborough, Brighton, and Eastbourne, are especially to be recommended.

Great attention must be paid to the clothing. The belly should be kept covered with a flannel bandage,[1] and the child should be dressed from head to foot in flannel or merino.

Great cleanliness must be observed. The whole body should be well washed every morning with soap and warm water, and be sponged every evening with warm water; and as he gets stronger warm or tepid sponging with salt water may be used to the back and loins. The bed and bedding should be removed from the room every morning, and be freely exposed to the air; the sheets must be changed frequently and must be carefully aired. The ventilation of the nurseries must be attended to, and at night a lamp placed in the chimney is useful to promote a free current of air.

The influence of the preceding measures is usually most marked, and it is at this time that tonic medicines are so valuable. They ought not, however, to be given until, by suitable treatment,[2] the motions have become healthy and the tongue clean.

Iron is one of the most important medicines we have at our disposal. A good form for its administration is the following:—

℞.—Liq. ferri pernitratis,
Acidi nitrici diluti, āā ʒss;
Syrupi zingiberis, ℥j;
Infusi calumbæ, ad ℥iij.—M. ʒij ter die.

If the debility is very great, the ammonio-citrate may be given with sal volatile—

R.—Ferri ammonio-citratis, gr. xij;
Spirit. ammonio-aromat.,
Æther. chlorici, āā ʒss;
Infusi calumbæ, ad ℥iij.—M. ʒij ter die.

or the tincture of the sesquichloride may be combined with dilute hydrochloric acid and chloric ether in the same infusion. Other preparations of iron are recommended, as the syrup of the iodide, the syrup of the phosphate, and reduced iron. The latter from its small bulk is very convenient, and may be given in doses of half a grain three times a day.

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[1] The abdominal bandage has another use in retarding the too rapid descent of the diaphragm. This, when the bones are much softened, affords great relief.

[2] See treatment of Simple Atrophy, p. 42 *et seq.*

Chalybeate waters, such as those of Tunbridge Wells, are also of service.

Quinine is very useful. Sir William Jenner[1] recommends half a grain of the alkaloid to be given with one or two drops of dilute sulphuric acid, in a teaspoonful or two of steel wine. The double citrate of quinine and iron is a good form; three or four grains may be dissolved in glycerine, and given three times a day.

Cod-liver oil is an important remedy. It should not, however, be given in too large doses. Ten to twenty drops may at first be poured into each dose of the mixture, and the quantity can be gradually increased to a teaspoonful. During its administration the stools should be examined from time to time. Any smell in them of the oil is a sign that more is being given than can be digested, and the quantity must therefore be reduced.

Tannin is recommended by Dr. Alison. It may be given in doses of from half a grain to a grain, two or three times a day in a little dilute nitric acid. I have seen very marked improvement follow the use of this drug.

Nux vomica has been advocated by some authors, but on account of the tendency to convulsions so often present in this disease, it must be given with very great caution. It is well to postpone its use until some improvement has already taken place, and the evolution of the teeth has recommenced. It will then be a useful addition to the other medicines.

There is little to be done in the way of special treatment of the bone deformities. Splints applied to the limbs, *as supports*, do more harm than good. The child should be prevented as much as possible from walking until reconsolidation of the bones has sufficiently advanced. Careful watching, however, is required to prevent his getting upon his feet, for as his strength improves his delight in his newly-accquired powers is prodigious, and he seems anxious by incessant activity to make up for his previously enforced quiet. Sir W. Jenner has recommended that splints which project below the feet should be applied to the legs. These, if properly arranged, effectually prevent his walking.

When the tenderness has subsided, the spine, and back generally, are much strengthened by careful shampooing. Each morning after his bath, the child should be laid upon his face on the bed, and the whole back should be well and firmly rubbed with the open hand from the neck to the buttocks. The frictions should be continued for about ten minutes. In the evening the same process may be repeated before the child is put to bed.

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[1] Medical Times and Gazette, May 12, 1860, p. 467.

In cases where the ligaments of the joints are very weak and relaxed, a carefully applied elastic bandage affords the best support.

Treatment of the complications.—The first symptoms of *catarrh* should always be attended to at once, for there is no complication which is so dangerous to rickety children.

The whole chest should be immediately covered with a hot linseed-meal poultice frequently renewed, and the following mixture should be ordered :—

℞.—Potas. iodidi, gr. v;
Potas. nitratis, ℈j;
Liq. ammon. acetatis, ʒiij;
Syrupi simplicis, ℥j;
Aq. cinnamomi, ad ℥iij.—M. ʒij quartâ quâque horâ.

The object is to produce as rapidly as possible free secretion from the bronchial tubes, for the tough mucus which is first secreted lines the walls of the air-tubes, greatly diminishing their calibre, and also is apt to form plugs which, driven farther and farther into the tubes, act as valves, permitting egress, but forbidding ingress of the air. This is, as has already been explained, the cause of the collapse so often found after death occupying the posterior and inferior parts of the lung. The thinner the secretion, the smaller the liability to the formation of these plugs, and therefore the less the danger of collapse.

When the cough has become quite loose, a little ipecacuanha wine, with a few drops of sal volatile, may be added to the mixture, and oxymel of squill may be substituted for the simple syrup.

If the debility is very great, a little wine or a few drops of pale brandy can be given every few hours while the mixture is being taken, but no stimulating expectorants should be prescribed until the secretion is copious.

If there is much rattling of mucus in the chest during respiration, a teaspoonful of vinum ipecacuanhæ may be given at once, and be repeated every ten minutes until vomiting is produced. An emetic, by its mechanical action, helps to clear the tubes of mucus.

When *diarrhœa* occurs, it must be checked as rapidly as possible, for the exhaustion it induces in a child already enfeebled is extreme. The following rules will be found useful in these cases, and in the acute diarrhœas of children generally.

If the tongue is furred white or yellow, the skin hot, the belly hard, and the motions green and slimy, with much straining and griping pain, give an aperient of rhubarb and soda, or castor oil, followed by a mixture containing magnesia with an aromatic :—

℞.—Magnesiæ, ℈j;
Syrupi zingib.,
Mucilag. acaciæ, āā ℥ss;
Aquæ carui, ad ℥iij.—M. ʒij ter die.

If the tongue is furred white or yellow, skin hot, the belly soft the motions pale, *frothy*, and sour smelling, *without* straining, give a mixture containing chalk, catechu, and aromatic confection.

If the tongue is clean and smooth, and the motions dark, watery, and stinking, with straining, give opium. If the diarrhœa continues, acetate of lead may be added :—

℞.—Plumbi acetatis, gr. xvj ;
Acidi acetici dil.,
Tinct. opii, āā ♏vj ;
Syrupi simplicis, ℥ss ;
Aquæ, ℥jss.—M. ʒj ter die.

If, in spite of this, the diarrhœa still goes on, the treatment recommended under the head of chronic diarrhœa must be resorted to.

When either of these complications (diarrhœa or catarrh) are present, the diet must be at once altered to suit the temporarily reduced power of digestion.

The treatment of *convulsions* and *laryngismus stridulus* is included in the treatment of the general disease of which they form such common complications. By removing the rickety condition the tendency to convulsions also disappears. During the actual presence of these attacks, Dr. Gee[1] recommends the bromide of potassium or ammonium to be given in four-grain doses three or four times a day to a child of one year old, and to be continued for a week or two after the fits have subsided.

The presence of a large head in combination with convulsive attacks often gives rise to a suspicion that the fits are due to hydrocephalus, and very active treatment is resorted to, often with the most disastrous result. Rickety children will not bear lowering measures at any time, and to reduce the strength while convulsions are actually present is only to increase the number and the intensity of the fits.

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[1] Saint Bartholomew's Hospital Reports, vol. iii., 1867, p. 103.

CHAPTER V.

CONGENITAL SYPHILIS.

Congenital Syphilis.—Appearance of first symptoms—Before birth—At birth—After birth—Snuffling—Necrosis of nasal bones—Eruptions on skin—Seat—Varieties—Scaly patches—Ecthymatous pustules—Papules—Tubercular spots—Ulcers—Mucous patches—Cracks and fissures—Complexion—Cry—Openness of fontanelle—Influence of the disease on general nutrition—Affections of internal organs—Hair—Local peritonitis—Spleen—Delayed symptoms—Syphilitic teeth.

Diagnosis.—By general symptoms—By history—By examination of other children of the same family.

Causes.—Transmission of taint from father—From mother—Mother seldom escapes if father affected—Colle's law—Other modes of infection.

Prognosis.—From observation of parents—Importance of considering the intensity of the general cachexia—Importance of certain special symptoms.

Prevention. Treatment.—Two objects—Treatment to be begun early—Remarks on the non-mercurial treatment—Treatment by mercury—Different preparations—External applications—Ointment—Mercurial baths—Improve general nutrition—Diet—Peculiarities of the milk in syphilitic mothers—Other foods—Cod-liver oil—Warmth—Cleanliness—Treatment of vomiting and diarrhœa—Local applications—Tonics.

Congenital Syphilis may manifest its presence in the child at three different periods—viz., before birth, at birth, or after birth.

If *before birth*, it occurs usually from the fifth to the seventh month of intra-uterine life. The child dies, and is born dead before the proper time. This disease is so common a cause of miscarriage that when labour has repeatedly occurred prematurely our suspicions should always be excited, and we should make inquiries as to the previous health of the parents, so that by the proper treatment of one or both, the lives of succeeding children may be preserved.

If *at birth*, the symptoms are usually very severe. The child, although born alive, is emaciated, and looks shrivelled. He snuffles and cries hoarsely. A few hours after birth, an eruption of pemphigus appears, situated principally on the palms of the hands and the soles of the feet. The bullæ become filled with a semi-purulent liquid, and burst, leaving angry-looking sores. Spots of inflammation, with abscesses, are scattered through the thymus gland and through the lungs. The liver is indurated. The infant may linger on for a few days, or weeks, but these cases almost always prove fatal.

Although appearing at birth, the symptoms are not, however, always so marked as those described. The amount of flesh may be considerable, and the lesions of the internal organs may not be present. In such cases the child may recover, but the prognosis is exceedingly unfavourable.

If *after birth*, the child is born apparently healthy. He is often plump, seems strong, and presents no symptoms by which even the most practised eye can detect the disease lurking in his system. Sometimes, however, although offering no distinct symptoms of disease, there is yet a something which seems to hint at the approaching outbreak. The face is rather old-looking; the skin inelastic and unnaturally pale; the complexion dull and wanting in transparence.

After a time, varying from two weeks to six or seven months, although rarely after the end of the third month, symptoms of the disease begin to be noticed. The outbreak of the symptoms may be determined by some febrile attack, as one of the exanthemata, the eruption of which subsiding leaves the syphilitic rash in its place. In almost all cases the first sign of the disease is snuffling. The mother in the beginning attributes little importanc to this symptom, and indeed does not usually mention it unless questioned specially upon the point, when she replies that the child has "had a cold" for a few days. Soon the mucous membrane lining the air-passages becomes more swollen, but even then there is not much snuffling so long as the child breathes through his mouth. When, however, he takes the breast, his difficulty of breathing through the nose bcomes at once apparent. Each inspiration is accompanied by a slight snore, and as the obstruction becomes more decided he can only suck at short intervals, desisting frequently and lying with the nipple in his half open mouth, so as to obtain a supply of air before making another effort to draw out the milk. Occasionally he snorts violently as if in an attempt to clear away some obstruction, and this often causes serious alarm to the mother, who will complain that the child "seems as if he were going to be suffocated when he takes the breast."

After a time there appears from the nostrils a slight watery discharge, which may be tinged with blood. It is seldom profuse at first, and is often merely enough to give a glistening appearance to the opening of the nares. Gradually, however, it becomes more abundant, and acquires consistence, so that it forms crusts which block up the nasal apertures, and still further impede the passage of the air. The discharge is intensely irritating, and scalds the parts with which it comes into contact, producing cracks and little ulcerations about the nostrils and upper lip, which become encrusted with minute scabs. Diday,[1] however, believes these external cracks and ulcers to be due to mucous patches, and to be independent of the discharge: the discharge itself he attributes to mucous patches developed on the Schneiderian membrane. In severe cases the ulceration thus set up within the nose may perforate the septum nasi, or lay bare the nasal bones which may become necrosed in consequence of the exposure. Fragments of these bones are sometimes found in the crusts thrown off. The bones may also become loosened and sink down, so that the bridge of the nose is flattened, and looks broader. In rare cases snuffling is the only symptom of the disease.

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[1] **On Syphilis in New-born Children, by P. Diday, New. Syd. Soc. 1859.**

Soon after the beginning of the coryza, an eruption is noticed on the skin. It is usually first seen about the arms and perineum in the form of flattened, slighly elevated spots, resembling very much in their colour the rust of iron, and which with a lens may be sometimes seen to be covered on their surface with minutes scales. More usually, however, no scales are visible, for as soon as formed they are "macerated by the natural moisture of the part, and become detached before they can acquire, by the evaporation of their fluid constituents, the pearly and brittle appearance which they would assume in the adult."[1] These spots are scattered over the perineum, surround the anus, and speckle the scrotum or the labia. Sometimes the eruption begins as an erythematous blush, at first bright red, which covers the buttocks and perineum, and may extend to the lower part of the belly. The colour soon gets more dingy, and has been aptly compared to the lean of ham. It becomes at the same time distinctly circumscribed, ending at its boundaries in an abrupt line. The coloured surface is scaly, and at its edges are seen the rust-coloured spots before described. The eruption is not limited to these parts; it often invades the folds of the joints, particularly the armpits, extends to the sides of the neck or the chin, and may be sprinkled all over the body. Other varieties of the rash are also found, as ecthymatous pustules, papules, tubercular spots mucous patches; and ulcerations, the result of these eruptions, may also be present.

When ecthyma is seen in any quantity, the aggregation of the pustules presents a very peculiar appearance, and the general aspect of a part covered with such an eruption differs entirely from that just described. The eruption is usually seated on the buttocks and perineum, and the pustules are more or less closely aggregated, the colour of the part varying according to the degree to which the pustules are separated. When crowded together, the general tint is a deep purple—not uniform, but broken up into patches of purple, separated by intervals where the colour is red. When the pustules are more widely apart, each one is seen to consist of a violet-coloured blotch, crowned with a thick, blackish crust, and surrounded by a deep red or copper-coloured areola. If placed sufficiently closely, the adjacent areolæ may join, so that all of the skin which is seen between the neighbouring pustules is of the same reddish or coppery hue. The scabs cover an ulcer, which is apt rapidly to deepen, and, unless checked by early treatment, may penetrate deeply into the tissues, and produce very serious results.

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[1] Diday, p. 66.

The ulcerations which arise from the other forms of eruption are often linear, and are compared by Trousseau to the narrow grooves found in worm-eaten wood. They frequently leave linear cicatrices, which may exist for a long time an evidence of the past disease.

Mucous patches, when they occur on the skin, are seen as round or oval slightly elevated patches, soft, and something of the consistence of mucous membrane. Their colour is reddish or grayish, and the surface is kept constantly moist by a thin, offensive secretion. They are usually found by the side of the anus, at the commissures of the lips, about the genitals, between the fingers and toes, or anywhere else where the skin is especially delicate and moist. When they occur on the mucous membranes, they are described by Diday as irregularly-rounded white elevations, in the centre of which a point of excavation shows itself: this spreads, so that after a very short time only a single ulcer is observed. It is not uncommon to find them on the arches of the fauces, but they never exist, according to Trousseau,[1] at the back of the pharynx. Still, on account of the difficulty often experienced in obtaining a good view of the back of the throat in a child, we can seldom be sure that there are no lesions on the posterior wall of the pharynx.

The skin of a syphilitic child is dry and parchment-like, and is often scaly, especially on the palms of the hands and the soles of the feet. Fissures are often seen between the fingers and toes, and may be found radiating from the anus and the corners of the month, and at the commissures of the eyelids.

A kind of whitlow is occasionally present from specific inflammation and suppuration of the matrix of the nail. The nutrition of the nail being thus interfered with, it gets dry, and falls off. M. Bouchut[1] states that he has seen a case in which every nail, both on the fingers and on the toes, was thus affected.

The hairs of the eyelashes and eyebrows often fall out; the edges of the eyelids then become scaly. The colour of the face is yellowish, and has been compared by Sir W. Jenner to the colour of weak *café-au-lait.* It is different from the earthy tinge often seen in chronic diarrhœa, and must not be confounded with it. This tint does not spread to the rest of the body, but remains limited to the face, where it is most marked on the more prominent part, being less noticeable on the deeper parts, as the internal angle of the orbit, and the hollow of the lower lip. Besides this peculiar tint of the face, there is a very striking pallor of the body generally, which is very slow to disappear, even after the subsidence of the other symptoms.

The cry of the infant is one of the most noticeable features of the disease; it is hoarse and high pitched, and when once heard is not difficult to recognize again. Its peculiar quality is, no doubt, due to an extension of the mucous patches to the larynx.

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[1] Clinique Médicale.

[2] Maladies des Nouveaux-nés. Paris, 1862.

As a rule, the fontanelle in children suffering from this disease is very widely open. It appears as if the cachexia exercised some influence in retarding ossification of the bones. Strangely enough, however, the growth and development of the teeth do not appear to suffer; indeed the contrary is found to be the case, for the teeth are often cut very early, and with remarkable ease. It is not uncommon to see the front teeth appear while the body is yet covered with the syphilitic rash.

Besides the above symptoms, nodes of the long bones may be present, and deposits may occur in the areolar tissue, tendons, and muscles. The posterior cervical glands are often enlarged. Iritis may also occur.

The general condition of the infant varies, not according to the severity of any particular symptoms, but according to the intensity of the general cachexia. The child sometimes continues plump, and although pale and rather weak, yet seems to suffer comparatively little from the effects of the disease. In other cases he wastes and becomes very feeble; his face, owing to the inelasticity of the skin, becomes wrinkled like that of an old man; he is peevish and cries constantly, never seeming to rest night nor day. His difficulty in taking the breast increases his irritability, and the consequent want of nourishment, his weakness. He dwindles rapidly; vomiting or diarrhœa may come on to increase his prostration, and he dies either suddenly from syncope, or slowly from exhaustion. According to Mr. Hutchinson,[1] such children are especially liable to serous inflammations, and pleurisy is a not uncommon cause of death.

Affections of the internal organs.—Suppurations of the thymus gland and of the lungs have already been mentioned as occurring in new-born children in whom the disease appears at, or a few days after, birth. Besides these organs, the liver, spleen, and peritoneum, are sometimes affected.

The *liver* is hypertrophied and indurated either generally or partially, the enlargement being sometimes confined to one lobe, or to a part of one lobe. When it occurs it is one of the earliest signs of the disease, and usually causes death in a few days. The symptoms which mark its presence are—besides the enlargement—pain in the belly, shown by moaning and uneasy movements of the limbs, vomiting, and diarrhœa, or constipation. The abdomen is tympanitic and tender on pressure; the pulse quick and small; the expression of the countenance is altered, and the features look pinched and drawn. There is rarely any jaundice. Gubler,[2] who first drew attention to this condition of the liver as a result of syphilis, describes the organs in highly-marked cases as hypertrophied, globular, hard, and elastic. It is extremely resistant to pressure, and creaks under the knife when cut into. On section the natural appearance of the surface is seen to be quite lost, and in its stead we see layers of small, white, opaque grains on a yellowish uniform ground. No blood, but only a little yellowish serum, escapes on pressure. The capillary vessels are obliterated, and the calibre of the larger vessels is considerably diminished. These changes are due to the development of large quantities of fibro-plastic tissue which compresses the hepatic cells, obliterates the vessels and consequently prevents the secretion of bile in the parts so affected.

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[1] Reynolds' System of Medicine, vol. i., art. Syphilis.

[2] Gaz. des Hôpitaux, 1848, Jan. Gaz. Méd., 1852, p. 262.

Local peritonitis often accompanies this condition of the liver. Whether it is a consequence of the induration, or may occur independently of the hepatic lesion, is a question which remains undecided.

Enlargement of the *spleen* in this disease, was noticed first by Dr. Samuel Gee, who embodied the result of his researches in a paper read before the Medico-Chirurgical Society, March 26, 1867; but, unfortunately, not included in their published volume.[1] Dr. Gee states, that "in about one-half of the cases of hereditary syphilis the spleen is enlarged, so that it can be felt during life. In about one-fourth the enlargement is really great. Sometimes the spleen only is enlarged; sometimes enlargment of the liver or lymphatic glands is superadded. The majority of cases of great enlargement die; yet syphilitic children with a greatly enlarged spleen may recover; the spleen gradually diminishing in size as the health improves. The degree of the splenic enlargement may be taken as an index of the severity of the cachexia, with this qualification, viz., that the spleen does not diminish *pari-passu* with the cachexia, but remains, it may be for years, a monument of what the cachexia has been. Hence, in children of three years old and upwards, who bear the marks of past syphilis upon them, we can often feel the spleen enlarged. Still more interesting and important is the fact that an enlarged spleen is sometimes the only sign of an active syphilitic cachexia."

In rare cases the symptoms of hereditary syphilis are delayed until the seventh, ninth, tenth, or even fourteenth year. Coppery, scaly eruptions may then appear, with discharges from the ears, nose, &c. Chronic interstitial keratitis may also occur at these times. This disease has been carefully described by Mr. Hutchinson;[2] it is not very common, but when it does occur, is symptomatic of hereditary syphilis. A peculiar malformation of the teeth is also sometimes found, for our knowledge of which we are indebted to the same author. This malformation affects only the permanent teeth, and is usually limited to the upper incisors. The upper central incisors are narrow and short. On account of this dwarfing they do not touch, and spaces are consequently left in the gum on each side. At the same time the edges are uneven from atrophy of the middle lobe, so that a broad, vertical notch is thus left in the centre of the edge, from which a shallow furrow or groove may pass backwards on both anterior and posterior surfaces nearly to the gum. The notching is usually symmetrical, but not always, for sometimes only one tooth is affected.

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[1] An abstract of this valuable paper appeared in the "Lancet" for April 13, 1867.

[2] Clinical Memoir on Certain Diseases of the Eye and Ear Consequent on Inherited Syphilis. 1862.

These symptoms may be found, not only when the disease is thus deferred, but also when it has appeared at the ordinary time during infancy. They constitute the tertiary stage.

Relapses are very liable to occur in children after the cessation of all symptoms, and when the disease is supposed to be cured. The most common form is the appearance of mucous patches, with large thickened elevated edges, seated by the side of the anus, at the angle of the mouth, on the tongue, or between the fingers and toes. The coppery eruption may also return, but not usually to any great extent.

Diagnosis.—In a well-marked case, the wizened face, the snuffling, the peculiar complexion, the hoarse cry, the emaciation, the dry and parchment-like skin, with the characteristic eruption scattered over the surface, the fissured lips and anus, form a collection of symptoms which when once seen it is impossible afterwards to mistake. We, however, constantly find cases in which many of the symptoms are absent. The child may continue plump, and be apparently in good condition; but here there is usually snuffling; rust-coloured spots are found about the perineum, and fissures will be seen radiating from the anus, and perhaps from the corners of the mouth. The general pallor of the skin is seldom absent, although the special "*café-au-lait*" tint of the complexion may not be noticed. The deep purple tint produced by a collection of ecthymatous pustules, presents a very characteristic appearance, and one which it is difficult to mistake, especially when it is combined with the cracks and ulcerations about the anus, &c. The appearance alone of ecthyma in an infant should lead us to suspect syphilis. Scabies is the only other cause which is found to produce such pustules at this early age, and this is at once detected by the absence of other sign of syphilis, by the fewer number of the pustules, and by the presence of the characteristic furrow peculiar to the acarus. Sometimes snuffling is the only symptoms which marks the existance of syphilis. In these cases the diagnosis is more uncertain, but a careful examination will often detect a few—perhaps only one or two—rusty spots about the body; if not, and the snuffling continues two or three weeks, specific treatment should be always had recourse to, for obstinate coryza is commonly due to a syphilitic taint.

If in doubt in any case, after a careful examination of the child's whole body, we should inquire into the health of the other children, examine them for signs of past disease, and question the parents as to their own health, especially as to the occurrence of previous miscarriages on the part of the mother.

The signs of past disease in the child are: flattened bridge of the nose, from long-continued swelling of the nasal mucous membrane when the bones are soft; markings of the skin by little pits, or linear cicatrices, from former ulceration, especially about the angles of the mouth; and protuberant forehead, from infantile arachnitis.[1] To these may be added enlarged spleen, which is found, according to Dr. Gee,[2] long after the disappearance of the other symptoms. If the permanent teeth have appeared the incisors should be examined for malformations.

Causes.—The disease may be transmitted from parents to children through the influence of either the father or the mother. In the child the degree of severity of the inherited taint is in proportion to the shortness of the time which has elapsed since the appearance of the primary symptoms in the parent. The father alone may be suffering from the disease, and may impart the taint to the child, according to some authors, without at the same time infecting the mother. The mother, however, seldom seems to escape the effects of the virus, whether it is that she absorbs the poison from the infected ovum, or contracts the disease from her husband. In all cases of supposed exemption from the disease occurring in women who have borne syphilitic children, a careful examination of the whole body would no doubt enable us to detect some signs of the disease. Colles,[3] in his work on syphilis, lays down the law that "a new-born child affected with congenital syphilis, even although it may have symptoms in the mouth, never causes ulceration of the breast which it sucks, if it be the mother who suckles it, though continuing capable of infecting a strange nurse." This is a very strong argument against the escape of the mother under such circumstances, for to be incapable of infection by the child she must be herself a subject of the disease. Various cases of apparent exception to this rule have been published, but none of them will bear the test of careful examination.

The mother alone may be syphilitic. These cases occur where a widow, infected by her deceased husband, marries in second nuptials a healthy man, and bears a diseased child; or where a healthy women married to a healthy man, suckles a syphilitic child, contracts the disease from it, and at her next confinement bears a syphilitic infant. Even if the mother be healthy at the time of impregnation of the ovum the child may still be born diseased, provided that the mother contracts the disorder after the fourth week, and before the completion of the seventh month of prenancy. Before the fourth week the embryo is nourished by imbibition, growing at the expense of the albuminous matters by which it is surrounded, and of the vitelline membrane; after the seventh month it is also leading a comparatively separate existence.

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[1] On Syphilis, by J. Hutchinson, in Reynolds' System of Medicine, vol. i.

[2] *Loc. cit.*

[3] On the Venereal Disease. 1837.

In cases where the father alone, or the mother alone, is syphilitic, the child is sometimes found to escape contamination, and to be born free from the disease. Where, however, both parents are infected, the infant's chances of escape become very much lessened, and he usually suffers severely from the inherited taint.

When the child is born perfectly healthy he may still be infected after birth. He may contract the disease during lactation, the nipple of the mother or nurse having become the seat of a syphilitic sore from contact with the mouth of another child who is suffering from the disease. Whether the milk of a syphilitic woman is capable alone of communicating the disease to a healthy child is open to very considerable doubt. Again, accidental contact with purulent matter from a chancre, or with discharges from a secondary sore, may inoculate the child, each of these secretions producing its own particular effect upon the infant, a primary sore producing a primary sore, and a secondary sore a secondary sore.

With regard to the possibility of syphilitic inoculation by vaccination, which was long denied, it seems probable, from instances published by Chassaignac,[1] Devergie,[2] Pacchiotti,[3] Nayler,[4] and others, that infection by this means may occasionally take place. Every case, however, in which the symptoms appear after vaccination must not be necessarily attributed to inoculation by tainted lymph. The first manifestation of the latent disease may be determined by anything which sets up a temporary febrile disturbance, and vaccination therefore may, like other things, be the stimulus exciting the outbreak of previously existing disease.

Direct inoculation by a primary sore in the vagina during delivery, although possible, is not probable, and no well-authenticated instance of such inoculation having occurred has been recorded.

Prognosis. Indications derived from observation of the parents.—As a rule, the prognosis becomes more favourable with each succeeding pregnancy, the tendency of the poison being to become less and less noxious as years pass by. This rule, however, is not absolute. Cases occasionally occur where the opposite conditions are found. Thus, if the father be syphilitic, and the mother, at the time of marriage, be perfectly healthy, in each succeeding pregnancy the fœtus becomes not unfrequently more and more profoundly contaminated, for in these cases the healthy mother may contract the disease from the tainted infant she carries in her womb. Consequently the greater the number of the previous pregnancies the more thoroughly is her system likely to be infected by the poison, and the more thoroughly will she communicate it to her offspring.

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[1] Journ. f. Kinderk. xliv. 1865.
[2] Journ. f. Kinderk. vi. 1866.
[3] Gaz. della Assoc. Med. 1865.
[4] British Medical Journal. 1865

Again, a man who has contracted the disease before marriage, and has undergone suitable treatment, may at first beget a perfectly healthy child. Afterwards, however, although no fresh symptoms may have appeared in the interval, he may beget other children who are syphilitic. These cases, of which well-authenticated instances are recorded, are explained by supposing that the treatment to which he was subjected "had for the time a sufficiently potent effect to maintain the seminal fluid in good condition, and that it had afterwards resumed its venereal character in proportion as the effects of the treatment became lessened by time."[1]

Still, if we find a woman bearing children, at first prematurely, then still-born at the full time, afterwards living but diseased, and still later producing children who present at first all the appearances of health, although carrying in them the germs of disease to be developed after a few weeks or months, we may reasonably infer that the poison is wearing itself out, and that each succeeding infant has a better chance than its predecessor of outliving the disease. As a rule, the longer the time which elapses between the birth of a child and the appearance of the first symptoms the greater is the likelihood of his recovery. According to Trousseau, the disease is almost always fatal when the symptoms appear during the first two weeks of life.

Indications derived from observation of the child.—It is to the intensity of the general cachexia, and not to the severity of any particular symptom, that we must look in order to estimate the amount of danger in each case. The prognosis is serious in proportion to the degree to which nutrition is interfered with, and therefore anything which tends to increase this defect in nutrition tends greatly to increase the gravity of the case. Thus vomiting and diarrhœa add their own enfeebling effects to the general weakening influence of the original disease, and, where they occur, must be looked upon as very serious complications.

There is, however, one special symptom which it is very important to take into consideration in forming a prognosis, as it may indirectly produce very serious results. This is the condition of the nasal passages. These passages may become completely blocked up, partly by the swelling of the Schneiderian membrane, partly by the caking of the crusts formed by the dried discharge. Two dangers may arise from this source. As air can no longer pass through the nose, the mouth becomes the only channel by which air can be admitted into the lungs. It is therefore required for respiration, and cannot be spared for any other purpose. The child is consequently prevented almost entirely from taking nourishment, for while he sucks respiration has necessarily to be suspended. He can only take the breast by short snatches, and the amount of milk he receives is very inadequate to his wants. The danger of starvation is thus added to the other dangers of the case, and may exercise a very unfavourable influence upon the termination of the disease. A second danger resulting from the condition of the nose is that arising from absorption of the noxious gases produced by decomposition of the pent-up pus. Septicæmia may occur in this way.

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[1] Diday.

On the whole, we may conclude that if nutrition appears to be well performed, *i. e.*, if the child continues plump, or does not sensibly emaciate, the prognosis is favourable. If he wastes, the prognosis is highly unfavourable.

Prevention.—When a child is born suffering from syphilis, measures should always be adopted to prevent succeeding children from falling victims to the same disease. One or both parents should be subjected to suitable treatment, which should be continued sufficiently long to render it probable that the next child will escape the effects of the virus. Even if a second pregnancy have already occurred before any treatment is adopted, we should still not despair, for cases are recorded[1] which show that very favourable results may be obtained by this means. It is important, however, that the treatment be begun as early as possible, and continued, if it can be borne, for three full months.

Treatment.—In the treatment of syphilitic children we have two objects. We have to destroy the cachexia which is weighing upon the child, and we have to sustain, and if possible to improve, the general nutrition of the body. The second of these objects is to some extent effected by the same means which accomplishes the first. As the intensity of the cachexia diminishes, nutrition usually improves in equal proportion; and, therefore, in the milder cases a child is often found, as the symptoms disappear, to become strong and healthy under no other treatment than that required for attacking the transmitted taint. In the severer cases, however, nutrition is so lowered that special means must be adopted at once to neutralize the effects and to remove the cause, of his malnutrition.

Treatment must be begun directly any symptoms appear to indicate the disease from which the infant is suffering. If the previous children have been syphilitic, and the parents in the interval have been subject to no treatment, the child should at once be placed under the influence of remedies, even although he may at the time present no symptoms of the disease, for it is of the highest importance that treatment should commence before the cachexia has produced any marked impairment of the nutrition of the body. If the parents have undergone treatment in the interval, a careful watch should be kept over the infant, and the first sign of the disease should be the signal for active interference.

Whatever opinions may be held with regard to the mercurial or non-mercurial treatment of syphilis in the adult, in the child there is not so much room for hesitation. As the danger of the disease lies in the intensity of the cachexia, as the prognosis is favourable in proportion to the time which has elapsed before the appearance of the first symptoms, a remedy which has the effects of weakening the power of the cachexia, and therefore delaying the outbreak of the symptoms, is not one to be lightly disregarded. Such delay may make all the difference between death and recovery, for to retard the appearance of the symptoms is in many cases to save the life of the child. A non-mercurial treatment is still, however, advocated by some writers; such treatment consisting in the administration of chlorate of potash with dilute hydrochloric acid, of cod-liver oil, attention to diet and cleanliness, and insuring a plentiful supply of fresh air, endeavouring, in fact, without special treatment to counteract the depressing influence of the cachexia upon nutrition, and by invigorating as much as possible the strength of the system, to enable it to overpower the constitutional poison, and to prevent this from manifesting its existence. Such treatment, when the taint is comparatively weak, is no doubt frequently successful. The disease is for the time kept under, and in every recurrence of the symptoms the danger is tided over by the same means. Cases, however, occur where this plan is quite ineffectual; and in severe cases where the contamination of the system is profound, and the danger to life imminent, it is surely unwise to neglect an agent which has so marked an influence on the disease. The power of the mineral over the cachexia is conclusively proved, as Diday points out, by its influence upon the mother during pregnancy. She is enabled by this means to bear a healthy child, although all her previous children may have been deeply infected. Besides, the rapidity with which syphilitic symptoms in the child will disappear under its use must be familiar to every one accustomed to infantile diseases.

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[1] Diday, *loc. cit.*

The child may be treated indirectly through the mother, or by the administration of remedies directly to himself. If the mother is suckling her infant, the first method is valuable as offering a suitable means for the simultaneous treatment of both mother and child. For the infant, too, it has this special advantage, that treatment by the medicated milk is less likely to cause irritation of his digestive organs, an occurrence of all things to be avoided. Besides, the remedy reaching the stomach in frequent small doses, and at a time when that organ is actively employed in the work of digestion, finds at once ready admission into the system. M. Bouchut urges the employment of this method in all cases as the most efficient and the safest way of treating the disease. In mild cases this mode of treatment will, no doubt, be sufficient to effect a cure, but more commonly we find it necessary in addition to give mercury to the child. It often happens that the secretion of milk in the diseased mother is so scanty, and so poor in quality, that the amount of the drugs which reaches the infant by this means is quite insufficient to produce any marked result; and in those cases where the child is much emaciated, and where it is important to bring him as rapidly as possible under the influence of the remedy, it is of comparatively little value unless aided by the direct method of treatment.

In giving mercury directly to the child, the preparation which is most commonly employed in this country is the ordinary hydrargyrum cum cretâ. Of this, one grain may be given at first, every morning and evening. After the first week the dose should be gradually increased every three days by a quarter of a grain at a time, until two grains are taken twice a day. To prevent any irritating action on the alimentary canal, a grain of carbonate of potash, or a few grains of prepared chalk, may be added to each dose. If, in spite of this addition, any disturbance of the stomach or bowels should be excited by the drug, the remedy should be omitted for a day or two until this derangement has subsided: it must then be recommenced. Should the disturbance return, the gray powder must be changed for one of the other preparations of mercury. A solution of corrosive sublimate in syrup is strongly recommended by French authors. Of this, Diday orders one-tenth of a grain to be given in (three) divided doses in the four-and-twenty hours, and to be increased by one-twentieth of a grain every three days until "some sensible effect is produced either on the mouth or on the syphilitic symptoms."[1] Calomel in doses of from one-twelfth to one-sixth of a grain is sometimes employed, and where vomiting has been excited by the other preparations, is occasionally effectual in calming the irritability of the stomach; but it is itself liable to be attended with diarrhœa, and can seldom be continued long without this danger.

Besides being given by the mouth, mercury may be also employed externally, so as to be absorbed by the skin, and this method forms a useful addition to the other modes of treatment. In cases where the internal use of mercury causes great disturbance, very valuable results are often obtained by this means, which allows of the treatment being continued while time is given for the irritation of the alimentary canal to subside. Still, as Trousseau[2] has pointed out, mercurial frictions and baths do not always act as safeguards against gastro-intestinal derangements. The frictions are made with unguentum hydrargyri, half a drachm of which is rubbed into the sides of the chest once a day; or a flannel band smeared with the ointment may be applied round the chest or belly. At the same time great cleanliness must be observed: each morning the surface of the body should be well washed with soap and warm water, so that all the old ointment may be removed before a fresh application is made. For the baths, corrosive sublimate is used, each bath containing half a drachm of the salt.[3] This quantity may be gradually increased by fifteen grains at a time, to a drachm, or a drachm and a half. The baths should be used every two, three, or four days, unless erythema be produced by their employment, when the quantity of the sublimate should be reduced, or the interval between successive baths should be increased. Besides the effect upon the system produced by the absorption of the mercurial salt, the baths are also beneficial by their local action upon the cutaneous lesions, and are strongly recommended by Trousseau for this purpose.

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[1] Diday, *loc. cit.*

[2] Clinique Médicale.

[3] Diday, *loc. cit.*

Of the different ways of treating the disease thus described, we must employ one or another, or several together, according to the condition of the infant. The more intense the cachexia—*i. e.*, the more complete the hindrance to nutrition—the more important does it become to bring the system as quickly as possible under the influence of the drug; but unfortunately it is in these cases that the susceptibility of the stomach and bowels to the irritating action of remedies reaches its height. Here, then, the external plan of treatment becomes of such extreme importance, and it must be aided by the cautious administration of mercury by the mouth, changing from one preparation to another as circumstances seem to require it.

At the same time, every effort must be made to improve general nutrition. It is extremely advisable that the child should be suckled, and the mother is of course the person upon whom that duty would naturally fall. Unfortunately, however, her milk is not unfrequently so altered in quality, that if it be secreted in sufficient abundance, which is far from being always the case, it is very apt to be difficult of digestion, and wanting in the nutritive properties so necessary for the efficient nourishment of the infant.

MM. Vernois and Becquerel,[1] from an analysis of nine cases of well-marked constitutional syphilis in the mother, not under treatment, give the following result of their researches into the constitution of the milk in that disease, as compared with the milk of a healthy woman.

	Specific gravity.	Water.	Solid parts.	Sugar.	Casein.	Butter.	Salts.
Syphilis . .	1034.05	902.38	97.62	44.21	35.26	15.87	2.28
Health . .	1032.67	889.08	110.92	43.64	39.24	26.66	1.38

It will thus be seen that the density of the milk is raised without any corresponding increase in the amount of the solid constituents, for these, on the contrary, are notably diminished. This peculiarity may be partially accounted for by the fall in the quantity of the butter, a diminution in the proportion of the oily constituent being always followed by a rise in the specific gravity of the fluid.

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[1] Du Lait chez la Femme, par MM. Vernois et Becquerel, 8vo., Paris, 1853.

The increase in the quantity of the salts may also aid in producing a condition which is not found in any other chronic disease. The result, however, is impoverished milk in the fullest sense of the word, for while the water which it contains is augmented, the casein and the butter, elements so important for nutrition, are diminished in quantity.

Poor, however, as is the quality of such milk, it is yet better that the child should be suckled than that he should trust entirely to artificial feeding for all the nourishment he requires. Besides, the analyses just quoted were all made upon the milk of women in whom the syphilitic symptoms were well marked. It is probable, therefore, that the disease assumes a milder form, the deviations from a healthy state in the relative proportions of the several constituents are not so wide as in the cases of which an average is given above.

If the secretion of milk in the mother is scanty (in which case it is almost certainly poor and watery), or if it appears to be of bad quality, although abundantly secreted, the child must be supplied with some other food in addition to the breast-milk. This is, however, often attended by considerable risk. It must be remembered that his digestive power necessarily shares in the general weakness of the whole system, and that food which a healthy child could readily digest is indigestible to him. He is also taking medicines, the common tendency of which is to produce irritation of his alimentary canal. Now, any additional irritation, such as would be produced by the presence of undigested food, would necessarily cause derangement of the stomach or bowels, or both; consequently the administration of remedies by the mouth would have to be suspended, and the recovery of the child would be considerably retarded, even if his life were not actually exposed to danger.

If ass's milk can be obtained, it forms the most suitable addition to the mother's milk; if not, new cow's milk, with or without lime-water according to the age of the child, must be resorted to. This should be given from a feeding bottle, with all the precautions recommended in an earlier part of this book.[1] The child should not be allowed to drink too much at a time, the quantity given and the frequency of its repetition being regulated by the quality of the mother's milk, by the age of the infant, and by the readiness with which the meal he has previously taken seems to have been digested. Farinaceous articles of diet should not be allowed unless the child be at least four months old.

Cod-liver oil is often of great service in these cases. Five or ten drops may be given two or three times a day, in a spoonful of the milk and lime-water, and if this is well borne, the quantity may be gradually increased by a drop or two at a time. If, however, it causes sickness or uneasiness, it must be stopped at once, to be recommenced after a few days, and in smaller doses. If any of the oil appears unchanged in the stools the quantity must be reduced. Should the skin generally be healthy, inunction of the oil may also be made use of, a teaspoonful being rubbed into the chest once or twice a day. If the skin is covered by the syphilitic eruptions, the frictions should not be used until these have disappeared. The child must be kept in an equable temperature of from 60° to 65° Fahr., partly in order to avoid the risk of cold, to which he is particularly susceptible while under the influence of mercury; partly on account of the beneficial influence upon the disease of a moderately high temperature, for all writers upon this subject unite in recommending warmth as an important aid to the other treatment.

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[1] See p. 39.

The utmost cleanliness must be observed. After taking food the mouth should be carefully washed out with a piece of linen rag dipped in warm water, to prevent any accumulation of milk round the gums and cheeks, a fruitful source of thrush. The napkins must be changed frequently, and the buttocks be carefully sponged and dried after each action of the bowels, for all unnecessary irritation of the skin must be avoided, and the continued contact of the urine and stools with the skin promotes the occurrence of the specific erythema. Besides, cleanliness is important in promoting the healing of mucous patches and other syphilitic sores about the anus. For the same reason the whole body should be bathed, at least once a day, with warm water, care being taken to dry the child thoroughly after each ablution.

If vomiting occurs, the internal use of mercury must be suspended, and should the gastric disturbance still continue, the child's nourishment must be limited to his mother's milk. If the vomiting does not subside by this means, all food must be forbidden, and the child be allowed nothing but cold barley-water, given at intervals with a teaspoon. These measures usually succeed in arresting the vomiting, and, in most cases, the mere suspension of the mercury is sufficient to produce this result. Should it, however, continue, a hot linseed-meal poultice must be applied to the epigastrium, and a powder containing one-sixth of a grain of calomel, with a few grains of powdered chalk, must be given every four hours; or a mixture containing five grains of bicarbonate of soda to a teaspoonful of infusion of calumba may be ordered three times a day. When the vomiting gets obstinate the case becomes one of great danger.

Diarrhœa is best treated by suspending the mercurial, and if this is not followed by stoppage of the disorder a mixture of chalk and catechu, with aromatic confection, is usually sufficient to restore the bowels to their natural condition. Diarrhœa is seldom obstinate in this disease if the directions already given as to diet, and avoidance of cold, have been properly attended to.

In cases where either of these symptoms has occurred, great caution is necessary in returning to the specific treatment, giving the mercury in smaller doses, and assisting it by the external application of that drug, either in the form of baths or ointment.

Local applications are useful as aids to the specific treatment in furthering the disappearance of the local lesions. It is important to remove these local symptoms as quickly as may be, for although many of them do not sensibly affect the prognosis, yet others, as the condition of the nose, may exercise an unfavourable influence on the termination of the disease. Besides, so long as there are contagious sores upon the body of the child, his attendants are liable to become infected by direct contagion, and this danger should be removed as promptly as possible. In the third place, a healthy skin is indispensable for the successful employment of frictions, either with the mercurial ointment or with cod-liver oil.

The baths of corrosive sublimate have, as has already been stated, a very favourable influence upon the cutaneous lesions, but there are other special applications which may be made use of in treating these affections.

When the nostrils become blocked up by hard crusts, these latter should be gently removed, after being softened by warm water and cold cream. When the internal surface is thus laid bare, a little mercurial ointment may be gently applied to the mucous membrane lining the nostrils with a feather, or with a piece of linen rag rolled up into the form of a slender cylinder. Diday recommends for this purpose an ointment composed of two to four grains of calomel to the drachm of lard.

Large crusts formed on the body should be removed by covering them with a thick layer of lard, and laying over this a hot bread-and-water poultice. This should be applied at night, and in the morning the softened scab can be easily detached, and the ulcer when exposed must be touched with the solid nitrate of silver.

Mucous patches about the mouth or anus must be well touched with the same caustic. They must be kept very clean, as previously directed. Ricord orders the patches to be washed twice a day with a solution of chloride of soda, and after each washing a small quantity of calomel is to be applied with pressure. Diday speaks very highly of this way of treating them.

Mercurial treatment must be continued sufficiently long to enable us to hope that the disease is not only arrested but cured. The disappearance of the eruption is not enough to give us this assurance, so long as the child remains weak and emaciated. Even after all the symptoms have disappeared it is advisable to continue the treatment for some time longer, being guided by the condition of the patient and by the severity of the symptoms by which the disease manifested itself. Diday recommends that, as a rule, specific treatment should be continued for three months, dating from its first commencement, provided that mercury has been administered *directly* to the child.

Relapses are, however, very liable to occur; and it must be remembered that these are frequently determined by some illness, as any of the minor disorders peculiar to childhood; by anything, in fact, which, temporarily lowering the child's strength and suspending healthy nutrition, allows the poison, subdued but not destroyed, to resume something of its former ascendency.

When specific treatment is abandoned it is generally advisable to give a tonic, as a mineral acid with bitter infusion, quinia, iron, cod-liver oil, &c.

Dr. West especially recommends the syrup of the iodide of iron as being very valuable in these cases.

CHAPTER VI.

WORMS.

Worms.—Varieties—Description—Oxyuris vermicularis—Ascaris lumbricoides—Tricocephalus dispar—Tænia solium—Tænia medio-canellata—Bothriocephalus latus—Development and mode of obtaining admission into human body.

Symptoms.—Due principally to the accompanying derangement of the stomach and bowels—Mucous flux—Very common in scrofulous children and in pertussis—Appearance of the tongue—Emaciation—Pain—Disturbance of nervous system—Convulsions—Symptoms when digestive derangement is trifling—Migrations of worms—Special symptoms with each variety of worm.

Diagnosis.—From tuberculosis—from tubercular meningitis.

Treatment.—Two objects—To expel worms—Different remedies required for each variety—Purgatives—Enemata—Santonine—Turpentine—Oil of male fern—To restore the healthy condition of alimentary canal—Diet—Alkalies—Alum—Tannin—Aloes—Iron—Treatment of prolapsus ani.

THE varieties of parasitic worms found in children are:—

NEMATODES—
Oxyuris vermicularis, the small threadworm.
Ascaris lumbricoides, the long round worm.
Tricocephalus dispar, the long threadworm.

CESTODES—
Tænia solium, the common tapeworm.
Tænia medio-canellata.
Bothriocephalus latus, the broad tapeworm.

Of these the two first mentioned varieties are by far the most common species found in the child. The tænia is rare in children under the age of six years, and the bothriocephalus is seldom seen in England, although common enough in Switzerland and Russia. When found in this country, it is usually in persons who have resided abroad.

Description.[1]—The *Oxyuris*, or *Ascaris vermicularis*, belongs to the order *Nematoda*. The male measures one-sixth of an inch in length, and its caudal extremity is obtusely pointed. The female is from a third to half an inch in length, and has a long, gradually tapering capillary tail which terminates in a three-pointed end. This has been supposed to act as a kind of holdfast.

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[1] The description of these worms is borrowed from Dr. Cobbold's work on Entozoa, royal 8vo., London, 1864.

Both sexes have a more or less fusiform body, the anterior end being narrowed to form a somewhat abruptly truncated head. The mouth is tripapillated, leading into a triangular œsophagus. The integument is transversely striated, and is of a silvery-white colour. The penis is single, simple, and very minute. The eggs are long, unsymmetrical, and measure about $\frac{1}{1400}$ in. from pole to pole, and $\frac{1}{900}$ in. in the greatest transverse diameter.

The seat of the worms is the lower part of the colon, especially the sigmoid flexure. They are not found in infants at the breast, unless other food is being given at the same time with the breast-milk, but are exceedingly common in older children.

The *Ascaris lumbricoides*, also a nematode, is much larger than the preceding. The male measures from four to six inches long, the female from ten to fourteen. The body, smooth, fusiform, and elastic, is marked by fine transverse rings, and tapers gradually towards either extremity. The mouth is tripapillated; the tail is obtusely pointed. The male is distinguished from the female by a double penis, and by the arcuate form of its tail. The female is broader than the male, being about a quarter of an inch in diameter.

These worms inhabit principally the small intestine, but often pass into the stomach and other parts of the alimentary canal. They are most common, according to Guersant,[1] between the ages of three and ten years. Their number varies from two or three to twenty, thirty, or even more; they are seldom solitary.

The *Tricocephalus dispar* is not very common in England, but is sometimes found after convalescence from typhoid fever. The male measures an inch and a half in length, the female two inches. This worm is especially characterized by an extremely long filiform neck, which occupies about two-thirds of the length of the body. The surface of the skin is smooth to the naked eye, but when magnified is found to have on one side a longitudinal band of minute wart-like papillæ, at the borders of which the ordinary circular striæ of the integument terminate. The tail of the male worm is curved, and has at the extremity a short tubular penis-sheath armed with minute retroverted spines. The tail of the female is straight and blunt-pointed.

The worm inhabits chiefly the cæcum and the colon.

The *Tænia solium* belongs to the order *Cestoda*. Its length is very great, often ten, twenty, thirty feet, or even more. In breadth it is about a third of an inch at its widest part. The head, globular, and about the size of the head of a small pin, is produced in front so as to form a short cylindrical proboscis, which is armed with a double crown of hooks, numbering from twenty-two to twenty-eight in each circular row. The head is also furnished with four sucking disks, situated at the four angles. The neck is very narrow, and is about half an inch in length; it is continued into the

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[1] Quoted in Valliex, "Guide du Médecin Practicien," quatrième édition, Paris, 1860.

anterior part of the body, which is sexually immature, and presents only traces of segmentation in the form of fine transverse lines. These lines become gradually more and more widely separated, having short interspaces; and eventually the imperfect segments become more distinctly marked, and true joints are seen. The earliest formed immature joints are very narrow; and it is not until about the four hundred and fiftieth segment from the head that they become sexually mature. The mature segment is called "pro-glottis." The total number of joints in a worm ten feet long, is about eight hundred. A mature pro-glottis is about twice as long as it is broad. It is comparatively thin and transparent, and is furnished with a branched uterus, which consists of a central, longitudinal stem, giving off from seven to ten branches on either side. Each joint has a common reproductive papilla placed at the border on one side below the middle line, but not uniformly to the right or left in series. The male orifice is above the vaginal outlet. The penis is sickle-shaped. The Tænia solium is usually solitary. It is seldom seen in children under three years old. Its seat is the small intestine.

The *Tænia medio-canellata* resembles the preceding in every respect except in the head. The cylindrical proboscis, and the double crown of hooks being absent.

The *Bothriocephalus latus* is the largest of the cestode worms which infest the human body. In length it is often five-and-twenty feet, and it is about an inch in breadth.

The head measures one twenty-fifth of an inch in breadth, is blunt at the top, elongated, and slightly flattened from behind forwards. It is furnished with two laterally disposed slit-like grooves, but is destitute of hooks. The anterior segments, which are sexually immature, are extremely narrow, and enlarge very gradually from above downwards. After reaching their greatest width in the centre of the body, they begin gradually to decrease in width, but increase in depth; so that while in the central segments the width is much greater than the depth, being as one inch to one-eighth of an inch, in the joints near the caudal extremity, the breadth and the depth are about equal, being frequently a quarter of an inch in either measurement. The body is flattened, but not so uniformly as is found in the Tænia solium, as it is rather thicker in the centre than at the sides. The total number of joints has been estimated at about four thousand, the first sexually mature one being the six-hundredth from the head.

The reproductive orifices are in the middle line towards the upper part of the segment on the ventral aspect. The vaginal aperture is immediately below the male outlet, and both openings are surrounded by papillæ-form eminences. The uterus consists of a single tube, often folded regularly upon itself so as to form an opaque centrally-disposed rosette-like mass.

The embryo is ciliated, and moves freely about in water.

The mode in which these different worms obtain admission into the human body is not well understood. It appears probable, however, that in the case of the Ascaris lumbricoides the drinking of impure unfiltered water is the ordinary method of admission. With regard to this worm, M. Davaine[1] states that the ova never become developed in the human intestine, but are expelled from it in large quantities. The yelk does not at once undergo segmentation, and consequent embryonic formation; but remains unaltered in the waters into which it is carried for six, seven, or more months.

After the embryo has been formed, it remains inclosed in the egg until it gains access to the body, when, the shell being softened by the intestinal secretions, it pierces the egg and undergoes further development in the bowel.

It appears from M. Davaine's experiments, that the development of the embryo is not aided by heat, neither was it found to be prevented by immersion of the egg for several days in the gastric juice of rabbits or dogs.

The development and migrations of the Tænia solium have been described by Dr. Cobbold.[2] In this worm each pro-glottis, or mature segment, is furnished with male and female reproductive organs. When this has become impregnated, by contact with another pro-glottis, eggs are formed in it. In each egg is developed an embryo which remains unhatched as long as the ovum remains in the body of the parent. The segment, after its expulsion from the bowel, moves about for a time until it bursts from the growth of the embryos in its interior, and the ova escape. Each embryo is provided with a boring apparatus, having three pairs of hooks at its anterior end. The embryo being eaten by some animal, as a pig or a rabbit, breaks its shell, and boring through the intestinal wall of the animal, lodges itself in the fatty parts of the flesh. It then drops its hooks and becomes the well-known Cysticercus cellulosæ. When the flesh of an animal containing the cysticercus is eaten, the parasite attaches itself to the wall of the bowel, and grows from its lower or caudal extremity.

It appears, therefore, that flesh infested with the cysticercus, is the ordinary source from which the tæniæ are derived. Pigs are very liable to be so infested, and in rabbits it is exceedingly common, very few of these animals being found altogether free from this parasite. In these animals it is the Tænia solium.

Oxen are sometimes infested with the embryo of the Tænia medio-canellata; and in children treated for chronic diarrhœa upon the raw meat plan, and who become in consequence affected with tapeworm, as is said sometimes to happen, it is to this worm that their symptoms are due. The drinking of impure water may possibly convey the embryo into the system, as is the case with the Ascaris lumbricoides; for M. Marteau de Granvilliers,[1] writing in 1762, states that tænia was a common disease at that time in a certain district in Normandy; the peasants of the neighbourhood drinking habitually the water from deep ponds.

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[1] C. Davaine, Recherches sur le Développement et la Propagation du Tricocéphale de l'Homme et de l'Ascaride Lumbricoïde. Comptes Rendus à l'Académie des Sciences, t. xlvi., 21 Juin, 1858.

[2] Entozoa, by S. Cobbold, M D., royal 8vo., London, 1864.

Symptoms.—The presence of worms in children is usually accompanied by an unhealthy condition of the alimentary canal, which precedes their appearance, and continues after the worms have been expelled. Few of the symptoms—and they are very numerous—which may be found while the worm exists in the body can be directly attributed to the presence of these parasites, as they may all of them, or nearly all, be found also in cases where repeated purgatives have convinced us that worms are absent. They are, therefore, probably due to the abdominal derangement which favours the development of the entozoa.

This derangement of the mucous membrane of the stomach and bowels consists in an increased secretion of mucus from the whole internal surface of the alimentary canal. The mucus thus poured out is exceedingly tenacious, and by its alkalinity acts as a ferment, causing decomposition of starchy food, and the formation of acid. The acid increases the consistence of this mucus by partially coagulating it, and by its presence excites the mucous membrane to further secretion. As a result, the food swallowed becomes enveloped by a coating of this secretion, and the bowels themselves are lined by the same tenacious material, so that digestion of the food is very much interfered with, and absorption is in a great measure prevented.

The mucus by its alkalinity partly neutralizes the gastric juice, and by covering the masses of food prevents their proper admixture with the digestive fluids. Albuminates decay and produce fetid gases; starchy food ferments and becomes acid; and constipation results from the inability of the intestines to force along the slippery masses in their interior. The mucus itself forms a most favourable nidus for worms, the irritation of which, in consequence of the sympathy existing between all parts of the digestive tube, promotes sympathetic irritation of the whole surface, and increases the secretion. If the irritation set up is very great, violent attacks of vomiting may take place, during which food and large quantities of glairy mucus are injected, with, sometimes, lumps of coagulated mucus. At the same time there is diarrhœa, with slimy, offensive stools, evacuated with much straining and pain, and masses of threadworms, one or two lumbrici, or segments of tænia, may be found in the matters discharged. After the subsidence of these acute attacks, there is for a time some relief to the symptoms; but they soon return, and the condition of the child becomes the same as before.

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[1] Journ. de Méd., Chir., et Pharm., 1762, t. xvii. p. 24.

Scrofulous children are especially liable to be infested with worms, as the unhealthy condition of the bowels so favourable to the development of those parasites is in such children exceedingly common. The same state of the intestinal mucous membrane is also an ordinary accompaniment of whooping-cough, in which case it is probably sympathetic with a similar condition of the bronchial mucous membrane, and worms are a frequent complication of this disease.

The condition of the bowels thus described is indicated by a peculiar appearance of the tongue, which varies in degree according to the intensity of the mucous flux. The tongue generally is flabby, and has a glossy, slimy look, as if it had been brushed over with mucilage. This slimy appearance is not always general, but in slightly-marked cases is limited to a spot in the centre of the dorsum, the rest of the surface and the sides having the ordinary aspect. The tongue is either perfectly clean, or is covered with a uniform coating of fur, remarkably thin and transparent. The general tint is often a light drab.

Whether furred or clean, however, there is one characteristic which is seldom absent. This is an unusual distinctness of the fungiform papilla at the sides of the dorsum. These papillæ are seen as large, round, or more commonly oval spots, seldom elevated, and varying in colour from pale red to deep crimson: the depth of colour being in proportion to the degree of irritability of the digestive organs. If vomiting and diarrhœa supervene, their colour becomes bright red, and they then project slightly above the surface, peering through the thick coating of yellow fur with which the dorsum in such cases is usually covered.

Although the appearance of the tongue thus described is not diagnostic of worms, yet it indicates a condition of the digestive organs in which worms are very likely to be found, and when it is noticed, worms should always be inquired for. When the tongue is seen to have a slightly slimy look, especially about the centre, to be covered with a thin coating of grayish transparent fur, and to have the fungiform papillæ at the sides, large, oval, not elevated, but pinkish red, and unusually distinct, worms are seldom absent.

As a result of this unhealthy state of the digestive canal, nutrition becomes impaired, and the child wastes. The face becomes puffy and pale; the lower eyelid dark, and sometimes leaden-coloured; the pupils often dilated. There is itching of the nose and anus; epistaxis may occur; and the sense of smell is occasionally depraved or lost. The upper lip often swells; the breath is fetid, especially in the mornings; and salivation is sometimes noticed, the saliva running from the mouth on to the pillow during sleep.

At night the child is very restless: during sleep he starts, twitches, and grinds his teeth; and he often wakes in great terror, crying and talking wildly. There is often a frequent dry troublesome cough, a symptom considered by Stoll[1] very characteristic of the presence of worms; and sighing, sobbing, and hiccough are not uncommon.

The belly is swollen and hard. Pain in the abdomen is often complained of, the pain being usually confined to one or two points, especially about the umbilicus. In character it is tearing or cutting, although sometimes it is merely an uneasy creeping sensation, or a feeling of cold in the bowels. The pain is sometimes felt in the chest.

The appetite is capricious. At one time there is constant craving, the hunger seeming to be almost insatiable: at others the child refuses all food, and great anxiety is excited by the difficulty found in persuading him to take nourishment. Sudden attacks of nausea may come on with sour smelling eructations, and vomiting may occur with expulsion of worms from the mouth. Lumbrici are not unfrequently ejected in this way. The bowels are much confined; the constipation yielding readily to purgatives, but returning when the action of the medicine has subsided. Sometimes there is tenesmus, with constant ineffectual desire to go to stool; and attacks of diarrhœa are very liable to come on, with very great straining, the motions passed being black, slimy, and extremely offensive. Micturition is often painful and difficult, and the urine whitish or milky. Discharges of mucus may take place from the rectum, and in female children from the vagina.

The pulse is often small, quick or slow, and irregular. The temper is irritable, or the child is sullen and morose. Attacks of syncope are sometimes seen, and there may be passing delirium, or even profound stupor. Other disordered conditions are enumerated as resulting from the presence of worms, as sudden blindness; loss of voice; squinting or fixed state of the eyes; vertigo; general convulsions. According to Dr. Underwood, an attack of convulsions, accompanied by small pulse and hiccough, is an almost certain sign of worms.[2]

As the majority of these symptoms are due, not to worms, but to the condition of the alimentary canal usually accompanying the parasites, the symptoms are severe in proportion to the abundance of the mucous flux. If this be copious, digestion is very greatly interfered with, nutrition is seriously impaired, and all the symptoms arising from indigestion and irritability of the nervous system are strongly marked. Worms may, however, be found in children in whom the alimentary canal is almost healthy. The general symptoms are in such cases exceedingly trifling, and the appearance of the tongue differs widely from that previously described. It is then neither flabby nor slimy; but is small and pointed, reddish at the tip, and is covered on the dorsum with a thin curdy fur. The papillæ are still large, but are less conspicuous, and their outline, instead of being evenly and clearly marked, is very irregular.

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[1] Prælectiones in Diversos Morbos Chronicos. Maximilian Stoll., vol. ii.

[2] Treatise on the Diseases of Children, edited, with additions, by Henry Davies, M. D., London, 1846, 10th edition.

Migration of worms sometimes takes place. They may pass out of the alimentary canal into passages communicating with it, or even into adjacent organs which have no direct communication with the digestive tube. Thus they have been noticed in the common bile duct, and in the gall-bladder, in two cases recorded by M. Guersant,[1] where the children died suddenly in violent convulsions. They have also been seen in the nasal passages, the larynx, trachea, the larger bronchi, in the vagina, and even in the urethra and bladder. Again, worms may be found in abscesses communicating with the intestine, having escaped from the bowel by perforating the wall, or by entering a pre-existing fistulous opening. The abscesses are generally in some part of the abdominal wall, usually the umbilical or inguinal regions, or in the substance of the liver. It is said that an artery may even be pierced by worms, and a case is reported by M. Charcelay[2] in which death resulted from this cause.

Certain *special symptoms* are associated with different varieties of worms.

The *Oxyuris vermicularis* occasions violent itching at the anus. This is most marked towards the evening, and the irritation not only prevents the child from going to sleep, but may be so intense as to produce extreme distress. The irritation propagated to neighbouring parts may excite a mucous discharge from the vagina, and is said to be a cause of masturbation.

A common symptom where these small threadworms are present is tenesmus, the desire to go to stool being frequent but ineffectual; and the straining may cause prolapsus ani, which often continues after the worms have been expelled. Besides, the irritation propagated over the whole intestinal tract is apt to give rise to diarrhœa. Migration of the oxyuris occasionally takes place, and cases are on record in which these worms were found in the vagina, uterus, urethra, œsophagus, and stomach.

When the presence of the oxyures is suspected, they will be often found on examination moving about in the radiating folds around the anus.

The *Ascaris lumbricoides* gives rise to pain more or less severe, situated at one or two points of the belly in the neighbourhood of the umbilicus. Sudden nausea is apt to occur from the passage of the worm into the stomach, and it is sometimes expelled by the mouth. The lumbricus is more apt than the preceding variety to give rise to nervous symptoms; and vertigo, convulsions, chorea, &c., sometimes seem to result from its presence, although it is very difficult to estimate the exact share which worms take in the production of these disorders. How much is due to the irritation of the parasites, and how much to the general irritability of the nervous system set up by the functional derangement of the alimentary canal, is a question which it is not easy to decide.

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[1] Quoted by Valleix, t. iv. p. 223, 4th ed. Paris, 1857.

[2] Quoted by MM. Rilliet et Barthes, Maladies des Enfants, t. iii. p. 867, 2d ed. Paris, 1861

The irritation of the lumbrici may give rise to a chronic diarrhœa, lasting often for months. The motions are scanty, offensive, of the colour and consistence of thin mud, and are evacuated with much straining, and sometimes prolapsus ani. They are more frequent in the night than during the day. A child of three years old lately came under my notice, who had suffered for nearly eight months from persistent looseness of the bowels. The diarrhœa ceased after the expulsion of twelve lumbrici.

Migration of the lumbricus may occur, and in cases where penetration of the wall of the intestine has taken place, and abscesses containing worms have formed under the integument of the belly, the worms belonged to this variety.

The *tæniæ* produce sensations of weight, and sometimes of gnawing in the belly, rising occasionally to severe attacks of colic, accompanied by considerable swelling of the abdomen, especially about the umbilicus. The appetite is usually large, and there is progressive emaciation, which is more marked than in the other varieties. Vomiting and diarrhœa are rare. Cephalalgia is not common, but when it occurs it is, according to Louis,[1] remarkably persistent. The same author remarked in the majority of his cases a great lassitude, and sometimes cramps in the extremities. Fragments of the worm are passed in the stools.

With the presence of the *Tricocephalus dispar* no special symptoms have been associated.

Diagnosis.—The only satisfactory proof of worms is their presence in the stools: any symptom or any combination of symptoms may be produced by other diseases, so that a purgative becomes the crucial test. It must be remembered, however, that although worms may be present, it does not necessarily follow that they have been the cause of the symptoms for which advice is required. Tuberculosis, scrofulosis, or other constitutional diseases may exist at the same time, the presence of the entozoa being an accidental and often a trifling complication. In such cases the symptoms will continue after the worms have been expelled.

The fact appears to be, that the large majority of the symptoms are due to the derangement of the stomach and bowels which is almost always associated with the parasites, and of which they appear to be rather a result than a cause, although, no doubt, the irritation they excite tends to encourage the derangement. When the mucous membrane of the alimentary canal is in a healthy state there is no *nidus* for worms, and it appears probable that a favourable medium is essential to their development in any quantity. The required nidus is found in the alkaline mucus which is so abundantly secreted, and in this they develop very rapidly. It is more important to detect the presence of some worms than of others. The tæniæ produce very great emaciation; and the lumbrici, if present in large numbers, may cause serious interference with nutrition; but the oxyures are of comparatively little moment, and unless the irritation be so great as to prevent sleep, are seldom attended with any great inconvenience.

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[1] Du Ténia et de son Traitement par la Potion Darbon. Mémoires ou Recherches Anat. path. Paris, 1826.

The symptoms attending the presence of worms may be so severe as to give rise to suspicion of the formation of tubercle. Thus, if a child has irregular attacks of fever; begins to lose flesh; sleeps badly, grinding his teeth at night; becomes pale and heavy-eyed; loses his cheerfulness, and gets languid and dull; has a capricious appetite, being sometimes ravenous, and at other times showing a disgust for food, with bowels alternately relaxed and constipated; in such a case the existence of tuberculosis might be reasonably suspected. If, however, the symptoms are due to worms, an active purgative will give evidence of their presence, and by clearing away a quantity of the tenacious mucus will cause an immediate improvement in the symptoms: afterwards suitable remedies and careful diet will restore the alimentary canal to a healthy condition.

In other cases, where the nervous symptoms are well marked, and are accompanied by a dilatation of the pupils, vomiting of watery fluid, constipation, and a slow irregular pulse, tubercular meningitis may be suspected. Here, however, the fact that signs of digestive derangement have preceded the nervous symptoms, the absence of headache, the readiness with which the constipation yields to a mild purgative, and the appearance of worms in the stools, will clear up the diagnosis. Besides, in these cases a history can often be obtained of the previous occurrence of similar attacks.

In cases where abdominal pains are complained of by children a careful examination of the chest should always be made, as in them the pain of *pleurisy* is very commonly referred to the belly, and not to the thorax.

Treatment.[1]—In the treatment of worms, it is not sufficient to expel the parasites from the body, for so long as the unhealthy condition of the alimentary canal continues to provide a nidus for the entozoa they will be frequently found to be reproduced again and again as often as they are driven out. There are therefore two indications to fulfil in the treatment of this complaint, viz.:—

To expel the worms.
To destroy the nidus by restoring the alimentary canal to a healthy condition.

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[1] All the prescriptions given in this chapter are adapted to a child of four years old.

To expel the worms, different measures must be employed, according to the variety of worm to be attacked.

The *oxyures*, which inhabit the rectum and sigmoid flexure, are within the reach of injections, and are best treated by this means. Different enemata may be used; thus, four or five ounces of strong infusion of quassia, to which two drachms of tinct. ferri sesquichloridi have been added; the same quantity of lime-water; or a solution of two drachms of common salt, dissolved in five ounces of distilled water, may be administered. A correspondent of *The Lancet*[1] suggests an injection of two scruples of aloes, rubbed up with half a pint of lime water. Whatever form of enema be used, it should be given at bedtime, should be used tepid, and should be preceded by a large injection (30 oz.) of warm soap and water, so as to empty the colon as thoroughly as possible.

The diarrhœa which is so common when the oxyures are present is readily arrested by a purgative, as castor oil, or the following powder:—

℞.—Pulv. jalapæ, gr. v;
Pulv. aloes Socotrinæ, gr. j;
Pulv. scammoniæ, gr. v. Ft. pulv. Primo mane sumendus.

This powder should be given every second or third morning, and every evening the injection should be repeated, until no trace of the worms is found in the stools, or in the returning enema.

Great irritation of the rectum may be allayed by the injection of an ounce of thin warm starch, containing, if necessary, a few drops of laudanum, before the child is put to bed; or a towel wetted with cold water may be applied to the fundament, while in bed, as recommended by Sir Thomas Watson.

For the *lumbricus* and the *tricocephalus dispar* the best remedy is santonine, which may be given either alone or combined with purgatives. A good combination is the following:—

℞.—Santonini, gr. xv.
Pulv. zingib., gr. v;
Pulv. jalapæ, ʒss;
Sulphuris loti, ʒjss;
Conf. sennæ, ℥j.—M. Ft. confectio.

Of this confection a teaspoonful should be given two or three times a day. Or it may be usefully combined with aloes, as in the following mixture:—

℞.—Santonini, ℈j;
Mucilag. acaciæ, ℥j;
Decocti aloes co. ad ℥vj.—M.
Ft. mistura. ℥ss ter die sumenda.

When given alone, santonine may be conveniently administered sprinkled on a slice of bread and honey, in doses of one or two grains, twice or thrice in the day. In such cases an occasional aperient will be required to carry off the dead worms.

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[1] Lancet, April 18, 1863.

Santonine usually increases the flow of urine, and may give a reddish tint to that secretion. Another effect sometimes found to be produced by the drug is a peculiar perversion of the sight, in which all objects are seen of a green colour. This symptom is of no importance, and readily passes away when the drug is omitted, but it is well to warn parents of its liability to occur.

Many other drugs have been recommended for the expulsion of these worms; thus mercury, antimony, granulated tin, nitrate of silver, and arsenic, kamala, kousso, assafœtida, tannin, valerian, and Corsican moss; all these drugs, alone or variously combined, have been used and found successful in these cases. Cowhage (the hairs of the mucuna pruriens) is strongly recommended by Dr. Dunglison,[1] and can be given in doses of half a drachm to a drachm, twice a day, in syrup or treacle. If the drug employed is not in itself purgative, it is well to combine it with some aperient, or at any rate to act gently upon the bowels, from time to time, so long as the remedy is in use. Violent purgatives are not needed in these cases, the repeated action of mild aperients being equally efficient in causing expulsion of the worms, without exciting so much irritation of the digestive canal.

The treatment of the *tæniæ* varies according to the age and strength of the child. If he is young and weakly, cowhage may be given, as recommended for lumbrici, with an occasional aperient, as castor oil, or the purgative powder given above. Powdered pomegranate bark is also very useful, and may be given in doses of five grains, in treacle, every four hours; or a decoction of the dried bark may be used instead.

For children over eight years old Dr. Davies[2] recommends turpentine to be given, in the following way:—

℞.—Olei terebinthinæ,
Mellis,
Mucilaginis acaciæ, āā ʒss ;
Aq. destil. ad ℥ss.—M.
Ft. haustus, sextâ quâque horâ sumendus ;

and every second day a powder containing calomel combined with pulv. scammon. co. should be administered. Dr. Davies states that he has never known tæniæ in children resist this treatment.

By far the most certain and effectual drug for expelling tapeworm is the oil of male fern ; and if the child is strong enough to bear the necessary fasting, the following method seldoms fails. In the evening a dose of castor oil must be given ; the following morning, after the bowels have been well relieved by the aperient the oil of male fern is to be given in the following draught :—

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[1] On Diseases of the Stomach and Bowels in Children. London, 1824.

[2] Dr. Underwood's Treatise on Diseases of Children, 10th edition, with additions by Henry Davies, M. D. London, 1846.

℞.—Olei felicis mas., ʒjss ;
Syrupi,
Mucilag. acaciæ, āā ℥ss ;
Aq. cinnamomi, ℥j.—M. Ft. haustus.

After three hours this draught must be followed up by a second dose of castor oil. The draught sometimes causes vomiting; if so, a second must be administered. An important part of this treatment consists in the fact that from before the first dose of the oil until after the worm has been expelled, somewhere about the middle of the following day, no food of any kind must be taken, and no drink, except water in small quantities, can be allowed. A fast of fourteen or fifteen hours is therefore required ; and, in the case of children, this cannot always be borne. As the tapeworm grows from the head, we cannot be certain that the entire worm has been expelled unless the head is found. This should, therefore, always be carefully searched for in the excretions.

To fulfil the second indication of destroying the nidus, our first care should be to regulate the diet. The mucus which is secreted in such large quantities acts as a ferment, causing rapid conversion of the starchy food into acid ; and the acid becomes in its turn a cause of increased secretion of mucus. To put a stop to this acid fermentation of food, all farinaceous articles of diet, except bread, must be excluded ; and even the bread should be considerably restricted in quantity, and should be eaten stale, or in the form of dry toast. Potatoes, peas, beans, turnips, carrots, parsnips, fruit, cakes, pastry, and butter, must all be forbidden, and the child should be nourished as nearly as possible upon meat, eggs, and milk.

A good scale of diet for a child over two years of age is the following, given as four separate meals in the course of the day :—

First meal. Fresh milk diluted with a third part of lime-water. A small slice of toast, or of dry, stale bread.

Second meal. A small mutton chop, or a slice of roast beef or mutton, without fat. Dry toast or stale bread.

Third meal. A cup of beaf-tea, or mutton-broth, free from grease. The yelk of a lightly-boiled egg. Dry toast.

Fourth meal. The same as the first.

It is not always easy to persuade children to submit readily to the deprivation of starchy food, for which, and especially for potatoes, there is often in these cases a great craving. So long, however, as the slimy appearance of the tongue, before described, continues to be observed, the above diet should if possible be adhered to. When potatoes are once more allowed, they must be well boiled, and should be afterwards carefully mashed with a spoon. Gravy may be poured over them before they are eaten.

In cases where the appetite is lost, and there is disgust for food, children often show an especial reluctance to take meat, which it is very difficult to overcome. A small bird, as a lark or a snipe, will however often tempt them, for their fancy is pleased by the idea of eating a whole bird, and this means frequently succeeds when all others fail.

A purgative should be administered about twice a week to clear away the mucus from the alimentary canal. The purgative used may be castor oil, or the powder of jalap, aloes, and scammony, given above, or a rhubarb powder with one or two grains of hydrargyrum cum cretâ if the stools are light coloured from deficiency of bile. To check the secretion of mucus, alkalies are of great service. They should be given with bitter infusion; and if the appetite is feeble, a drop or two of dilute hydrocyanic acid may be added, as recommended by Dr. Andrew Clark in the anorexia so often attendant upon pulmonary phthisis. Thus, for a child of four years old:—

℞.—Acidi hydrocyanici diluti, ♏xv ;
Potassæ carbonatis, ʒjss ;
Infusi gentianæ co., ℥iv.—M. ℥ss ter die sumenda.

Alum is also useful in these cases. It may be given with aromatic sulphuric acid, as in the following mixture:—

℞.—Aluminis, ʒss ;
Potas. sulphatis, ʒij ;
Acidi sulphurici aromat., ʒss ;
Syrupi zingiberis, ℥j ;
Aquæ destillatæ ad ℥iv.—M. ℥ss ter die sumenda.

Or a mixture containing tannin and nitric acid:—

℞.—Acidi tannici, gr. v ;
Acidi nitrici diluti, ʒss ;
Syrupi, ℥j ;
Aquæ ad ℥iv.—M. ℥ss ter die sumenda.

Aloes is also a valuable remedy, and seems to exercise a great influence in restraining the secretion of mucus. The most convenient form is the compound decoction, which, if well made, is seldom objected to by children; the liquorice, and the compound tincture of cardamom it contains, very effectually disguising the nauseous bitter of the aloes. It may be given in doses of two or three drachms twice or thrice in the day.

After a time iron should always be resorted to. A grain or two of the sulphate may be added to the alum mixture; or other preparations may be used, as the vinum ferri; the potassio-tartrate, with Rochelle salt, in bitter infusion; reduced iron in powder; or the double citrate of iron and quiniæ. The potassio-tartrate goes well with the compound decoction of aloes. A good preparation is the following:—

℞.—Liquor. ferri pernitratis,
Acidi nitrici diluti, āā ʒss :
Infusi calumbæ ad ℥iv.—M. ℥ss ter die sumenda.

Cod-liver oil is always useful, and should never be omitted if there is much emaciation. If it excites nausea, inunctions in the skin may be practised.

Warm alkaline baths are of service in exciting the action of the skin, and should be used at night.

Change of air should be always recommended after a time. Removal to a bracing sea-side air, such as that of Brighton or Margate, will often, after only a very short stay, produce a most marked improvement in the symptoms and general appearance of the child.

The above treatment must be varied according to the condition of the stomach and bowels, and need not be pursued in all its details in every case of worms. If there is little derangement of the alimentary canal, purgatives or injections to remove the worms, followed by a tonic, will be all that is required. It is only in cases where the secretion of mucus is in great excess, and the interference with digestion and assimilation of food is carried to a high degree, that all the measures given above are required.

The *prolapsus ani*, brought about by the great straining excited by the presence of worms, usually disappears when the worms have been expelled. Sometimes, however, it remains as a persistent condition. In such cases the prolapsed bowel should be sponged with warm water after each action of the bowels, and should be carefully returned by gentle pressure with the thumbs covered with a soft, warm napkin. If the contraction of the sphincter is very violent, and resists the return of the protruded gut, the finger, well oiled, should be introduced into the bowels, and should be passed within the sphincter so as to carry the bowel with it above the contracting ring.

Prolapse may often be prevented by placing the child during defecation in such a manner that his feet do not touch the ground, and, at the same time, the edge of the anus can be supported by two fingers.

The bowels must be carefully regulated so as to prevent constipation and consequent straining. The child should be warmly clothed, with a flannel bandage round the belly, and should take frequent exercise in the open air.

For medicine, a drop or two of tinct. opii may be added to each dose of the tonic mixture; and twice a day a small astringent injection may be used, as decoction of oak-bark, or of rhatany-root, to give tone to the relaxed mucous membrane, and remove the tendency to prolapse.

These cases seldom give much trouble, and are usually readily cured.

CHAPTER VII.

CHRONIC TUBERCULOSIS.

TUBERCULOSIS.—A diathetic disease attacking the organs generally—May be acute or chronic—Yellow infiltrated tubercle of Laennec not true tubercle—Gray and yellow granulations may coexist in the same organ—Differences between them—Changes in tubercle—The tuberculous and scrofulous types—Distinct, but not antagonistic.

Symptoms.—Of chronic tuberculosis—Shapes of chest.

Diagnosis.—In infants—Value of the thermometer—In older children.

Causes.—The result of a constitutional tendency—Exciting causes—Inoculation of tubercle.

Prevention. Treatment.—Climate—Exercise—Fresh air—Diet—Attention to digestive organs—Astringents—Alkalies—Cod-liver oil and tonics not to be given too early.

TUBERCULOSIS, a diathetic disease giving rise to the formation of tubercle, is in children exceedingly common. Its existence is indicated by certain general symptoms. Following or accompanying these general symptoms are other local symptoms, showing the presence of tubercle in one or more organs of the body, and the disease is then called pulmonary, bronchial, mesenteric, phthisis, &c., according to the organ of which the local symptoms predominate. The child differs from the adult in a tendency to a general formation of tubercle. The lungs constantly suffer, but they do not suffer alone: the membranes of the brain, the bronchial and mesenteric gland, the pleura, peritoneum, liver, spleen, and in fact all the organs, of the body exhibit a nearly equal readiness to be invaded by this, the anatomical expression of the general disease, and to suffer simultaneously from the same morbid condition. The local symptoms are, however, usually confined to one or two organs, the lesions of the others, less severe or less noticeable, being only discovered by post-mortem examination.

Tuberculosis may be either acute or chronic in its course. When acute, it is invariably attended by the development of miliary tubercles in the organs generally. When chronic, the same result may take place; but sometimes we find in these cases early symptoms arising from the lungs with evidence of consolidation, and eventually of softening and excavation. These changes are found after death to be due to the presence of a morbid yellow material which, differing in character from ordinary miliary tubercle, is regarded by many pathologists as the result of scrofulous inflammation, and hence bears the name of scrofulous pneumonia. This material is the infiltrated yellow tubercle of Laennec and his followers. It is true that we often find in the same lung every degree of pathological formation between true miliary tubercle and the dense masses resulting from scrofulous inflammation, but one of the results of miliary tubercle is to excite inflammation around it; lobular pneumonia is set up, and the deposit, instead of becoming absorbed, as occurs in pulmonary inflammation attacking a constitutionally healthy patient, tends, in one of scrofulous habit, to soften, break down, and excite ulceration in the tissues around. The masses will accordingly be large or small, according to the extent of pulmonary tissue involved in the inflammation.

Miliary tubercle occurs in two forms, the gray and the yellow granulation.

Gray granulations consist of gray, round, hard, elastic, dense masses about the size of a millet-seed, which on section of the lung are found projecting from the cut surface. They resist pressure, and are not easily crushed by the nail. The colour is gray and semi-transparent, and in the centre they often contain a black point or a small quantity of yellow tuberculous matter.

The yellow granulation is rather larger than the gray. It is of a bright yellow colour, and on pressure is not crushed, but flattens out like recent false membrane. It is evidently the result of degeneration of the gray granulation, for every stage can be traced in the change from the one form to the other. The gray granulation first turns white: an opaque yellow spot then appears in the centre: this extends until the whole substance is converted after a time into a yellow mass. This degeneration of the gray granulation sometimes goes on so rapidly that the tubercle seems to have been yellow from the first, the processes of formation and of degeneration appearing to take place simultaneously. Thus, in a rickety child ot twenty months old, in whom death took place from acute tuberculosis after an illness of seven weeks, the lungs were found to be stuffed with miliary yellow tubercles, none of which were larger than a hempseed, the greater number being very much smaller. There was no gray tubercle anywhere. Usually, however, the yellow and the gray granulations coexist in the same lung. The granulations, scattered at first, become collected together as the morbid process goes on more rapidly, so as to form masses of tubercle of variable form and size. The bulk of these masses is no doubt increased by the occurrence of pneumonia, the deposit of which degenerating and becoming yellow, is indistinguishable by its naked eye or microscopic character from true tubercle.

Besides the lungs, tubercles are found in the parenchyma of solid organs, as the liver, spleen, kidney, brain, &c. They may also occupy the serous and mucous membranes, the lymphatic glands, the bones, muscles, and external areolar tissues. In the case of acute tuberculosis, the greater number of these tissues appear to suffer, and are found after death studded with gray granulations. When the disease is more chronic, several of them may escape:

the granulations are then more commonly yellow, and are often grouped into masses. Occasionally only one or two organs are found to be affected with tubercle, but this is the exception. In such cases the tubercle is seated in the lungs and the bronchial glands, these two organs far surpassing the others in their proneness to be invaded by this morbid change. The processes of tubercular formation and degeneration appear to go on with greater rapidity in some organs than in others. Thus it is not uncommon to find in the same subject gray granulations in the liver, yellow granulations in the lungs, and in the lymphatic glands masses of yellow substance resulting from the aggregation of miliary tubercles.

The difference between gray and yellow tubercle consists in the greater proportion of fat elements contained in the latter. As the fatty degeneration continues, the yellow tubercle becomes softer and softer, the softening process beginning either in the centre, or at a point on the surface, and being very much influenced by the degree of softness and humidity of the tissue in which it is contained; the more yielding and the moister this may be, the quicker does the change take place. At the same time the surrounding tissue suppurates; becomes infiltrated with cheesy matter, the result of inflammation; and a cavity containing a purulent fluid is formed, the consequences resulting from which vary according to the organ in which this change occurs.

Sometimes a different transformation takes place; the tubercle, instead of softening into a purulent-looking fluid, shrinks and hardens into a cretaceous mass, by absorption of its fluid constituents.

These changes will be more fully described in considering the anatomical characters of pulmonary phthisis.

Children who are disposed to be the subjects of tuberculosis are often distinguished by certain peculiarities, which are held to constitute a type of the tuberculous diathesis. They are tall for their age and slightly made; the skin is delicate and transparent-looking, allowing the superficial veins to be distinctly seen; the face is oval, and the features generally regular. The complexion is usually clear, but not always; the face is sometimes covered with freckles; and Dr. Gee is of opinion that amongst the poor children of London the existence of freckles is evidence of very singular value of a tubercular tendency.[1] These children are often remarkably good-looking, with large, bright, intelligent eyes, long eyelashes, and soft silken hair. The limbs are straight; the wrists and ankles small. The nervous system is highly developed, and the general organization delicate. The teeth are cut betimes; they walk and talk early; and the fontanelle often closes before the end of the second year.

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[1] **Quoted from a Clinical Lecture on Phthisis, delivered by Dr. Gee, at the Ormond Street Hospital for Sick Children.**

If we compare this type of body with the peculiar conformation considered to be characteristic of the scrofulous diathesis, we notice remarkable differences. Here the face is more rounded than oval the complexion is dull and pasty-looking; the skin thick and opaque. The face is not so comely as in the preceding type, although it is by no means necessarily ill-favoured; the features are large; the lips full; the alæ of the nose thick; and the nostrils expanded, so that the nose looks broad. The tongue is often large. The ends of the long bones are full, and their shafts thick. The fingers are often clubbed. The belly is large and prominent. In such children there is great activity of all the epithelial structures. The hair and nails grow rapidly; the skin generally is rough and scaly; and there is often a remarkable development of hair, which is seen as a thick down on the forehead, cheeks, ears, and along the spine. There is constant secretion from the nose; the skin about the lips is subject to crack, and to become sore; the eyes often look weak, even when not inflamed; and there is great tendency to ophthalmiæ, inflammation of tarsi, catarrhs, certain skin diseases, irritation and inflammation of the lymphatic glands, to caries of the bone, and to a low form of pneumonia.

These two types of body are very distinct, but they are not antagonistic. Tubercular formation may occur as an accompanying phenomenon of either, and either may be marked by that form of pulmonary phthisis known by the name of scrofulous pneumonia; but of the two, in the tuberculous diathesis there is an especial tendency to the former disease; in the scrofulous diathesis, to the latter.

Symptoms.—Tuberculosis may be acute or chronic in its course. With the acute form we have in the present volume nothing to do: the attack having all the ordinary characters of an acute disease—irregular febrile disturbance, more or less high; rapid emaciation; great depression of strength and spirits; ending, in the large majority of cases, after a few weeks in death, if the disease be severe—in recovery, if it be mild, without any satisfactory evidence of local change. In some cases, however, there is localization of the disease in some particular organ, and a lapse into chronic phthisis.

The acute and the chronic forms of tuberculosis are not separated by any well-defined limits, but between them there are infinite gradations depending upon the intensity of the fever, the length of time the disease lasts, and the rapidity with which local symptoms arise to show that some particular organ is more especially affected than the others, or is more sensitive to the changes which are taking place within it. The chronic form may not remain chronic, but may suddenly assume an acuter type, or may appear to do so from the occurrence of some inflammatory complication.

When the disease is chronic from the first, one of the earliest symptoms is a want of healthy colour of the face, which soon becomes distinct pallor. The child is listless; he still continues to play at his accustomed amusements, but does so without spirit, and quickly tires. His flesh becomes flabby, and he soon begins to waste. He complains of no pain, and when questioned merely says he is "tired." The appetite continues good, and thirst is not very marked, although at night he may wake up and ask for drink. Digestion seems well performed, and the evacuations are natural. At night he may get a little feverish, especially about the palms of the hands and the soles of the feet, which feel dry and hot, but he sleeps well and tranquilly, although in the morning he shows some unwillingness to leave his bed.

In children in whom the diathesis is marked, the shape of the chest is often peculiar.[1] The lungs being small, relatively and absolutely, the wall of the chest is obliged to adapt itself to the size of its contents. The thorax is consequently elongated. The ribs are exceedingly oblique, the sixth, seventh, eighth, and ninth, in particular, passing very much downwards, and their cartilages very much upwards, so that the angle of union is unnaturally acute. The four uppermost intercostal spaces are widened next to the sternum. The four lowest are almost obliterated by approximation of their ribs. The diaphragm is usually arched, for it retains its natural level while its attached margin is lowered, and a certain number of the ribs, often from the eighth to the twelfth, lie, for the greater part of their extent, in contact with the diaphragm without any lung underneath them. In addition to the lengthening of the chest, two different shapes of thorax are found, according to the condition of the cartilages: if these remain firm, the chest is long and almost circular; if they are soft, it is flattened from before backwards.

A third variety of shape is a form of the pigeon-breasted thorax. It is the result of repeated catarrhs affecting the lower lobes of children in whom the lungs are small. Air being unable, during the catarrh, to obtain ready access into the lower lobes, the inferior ribs are driven inwards at each descent of the diaphragm. The sternum is thus carried forwards, the degree of protrusion depending upon the height to which the impediment to the entrance of the air extends into the bronchi.

This form of pigeon-breasted thorax is distinguished from the pigeon-breast so common in rickets, by the different shape of the upper part of the chest in the two diseases. In rickets, *all* the ribs being softened, the deformity extends as high as the second rib. In tuberculosis only the lower end of the sternum is thrown forwards, the upper part of the chest being flattened from before backwards.

This third variety of chest may be found in a healthy child, the lower lobes of whose lungs have become diminished in size through permanent collapse dependent upon repeated attacks of bronchitis. It is not, therefore, distinctive of tuberculosis.

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[1] See an article on Tuberculosis, by Sir W. Jenner, Medical Times and Gazette, July 6, 1861.

The symptoms which have been enumerated continue for some time: gradually, the emaciation increases; the cheeks get rather hollow, the eyes sunken, and all bony projections more strongly marked. The skin remains thin and transparent, or becomes dry, rough, and yellowish. The child gets more and more listless, is dull and apathetic, exerts himself unwillingly, and prefers sitting or lying down to movement, often complaining that his legs ache. The pulse becomes frequent, but generally varies in rapidity according to the degree of fever: when the fever is high, the pulse is quick; when the fever subsides, the pulse slackens. It is always regular in rhythm. This relation between the pulse and the temperature is not, however, always preserved; the pulse may be rapid without any perceptible increase of the temperature of the body. Usually the skin gets hotter and dryer as the disease goes on, the temperature rising at night to 102° or 103° Fahr., perspirations occurring towards morning. Sudamina in older children may be seen on the chest; but this is not so common as is the case with adults. The appetite is preserved, or may get capricious; there is some thirst; and the tongue is clean and reddish, or slightly furred. The bowels are often irregular, constipation alternating with occasional attacks of diarrhœa, when the motions are light-coloured and offensive. The sleep at these times may be disturbed, the child waking with a start, or crying in great terror.

After a time the breathing becomes more rapid; there may be a little cough, and vague pains are often complained of about the chest and belly. The emaciation goes on slowly as long as the febrile disturbance remains trifling; but when this becomes more marked, the loss of flesh is rapid, and the intensity of all the symptoms is increased. Increased rapidity of wasting may be a sign of the occurrence of some inflammatory complication.

The weakness at length becomes so great that the child keeps his bed, and can hardly be persuaded to sit up even to take food. The appetite fails completely; aphthæ appear upon the tongue, gums, and inside of the cheeks and lips; the lower limbs and depending parts of the body, are swollen from the presence of œdema due to the impoverished state of the blood, independent of any enlargement of the mesenteric glands; and death may occur without any special symptoms having arisen to suggest disease of any particular organ. More usually, however, long before this period, some local symptoms have been noted, often early in the disease; and it occasionally happens that these local symptoms are the first signs by which attention is attracted to the state of the child's health.

Chronic tuberculosis seldom runs its course without irregular attacks of acute or subacute febrile disturbance, whether from increased formation of tubercle or from inflammation. The temperature almost invariably rises toward evening, and will be found to be over 100° Fahr., by a thermometer placed in the axilla.

Diagnosis.—The diagnosis of chronic tuberculosis before any signs have appeared to denote special lesion of organs is exceedingly perplexing. In infants the difficulties are especially great at first, although, usually, localization of the disease occurs more readily in them than in older children.

Besides actual examination of the infant, very valuable information can be obtained by inquiries into his previous history, the diseases through which he has passed, the good or bad hygenic conditions under which he has been reared, and the health of his parents and family generally. Thus, if a child has been brought up injudiciously, and has escaped rickets; if the parents or other members of the family are the subjects of tubercle; or if the child has lately suffered from measles or whooping-cough, and has never completely recovered, we should suspect tuberculosis. But even with this assistance it is not easy to arrive at a satisfactory conclusion, at any rate, at once. Simple wasting from insufficient nourishment, may very closely simulate tuberculosis; chronic diarrhœa may be the result of tubercular ulceration of the bowels; and a rickety child may have tubercle developed as a secondary condition. In these cases the results of treatment afford a very important means of estimating the nature of the disease. Thus, if the diet and hygienic arrangements are altered, and the child instantly begins to improve, the absence of tubercle becomes exceedingly probable. If, however, a different result follows such alteration, and the condition of the child remains unchanged, it does not necessarily follow that tubercle is present, for chronic diarrhœa may persist and may cause death, not only without tubercle existing, but even without the existence of any lesions sufficiently serious to account for the fatal termination. Under such circumstances the thermometer becomes an important aid to diagnosis. None of these diseases are accompanied by a persistent increase of temperature, although a very slight cause is sufficient to produce a temporary increase in the heat of the body. If, then, we find persistent elevation of temperature at night, estimated by the thermometer in the axilla, and that this elevation continues for several days or weeks in succession, without any discoverable cause to account for the rise, we may safely diagnose tuberculosis.[1] Unless, then, we can obtain some positive evidence, such as that afforded by the thermometer, it is better in the case of an infant to reserve a decision, until some more decided symptoms are manifested; and these are seldom long postponed. Localization of the disease soon draws attention to some especial organ, usually the lungs or the bronchial glands.

In the case of older children the diagnosis rests upon steady emaciation, accompanied by more or less irregular febrile disturbance, without any serious local lesion to account for the symptoms. Under such circumstances worms are often suspected, and purgative after purgative is given to clear out the supposed parasites from the bowels. As has been already stated, however, all the symptoms usually attributed to worms may be present, although repeated aperients fail to produce any evidence of their existence. A condition of the alimentary canal is frequently noticed in children which consists in abundant secretion of intestinal mucus, causing fermentation of food, and great impediment to digestion and assimilation. This does not necessarily lead to the formation of tubercle, although it is sometimes followed by ill-defined spots of dulness about the lungs, and by glandular enlargements. These phenomena would perhaps be more correctly ascribed to scrofulous changes than to true tubercle, and they are besides by no means a necessary result of the derangement. One essential difference between this disease and tuberculosis is seen in the fact, that by proper measures the former can be readily cured, and the result of treatment becomes, therefore, a test of the nature of the disorder.[1]

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[1] On the Temperature of the Body as a Means of Diagnosis in Phthisis and Tuberculosis, by Sydney Ringer, M. D. London, 1865.

In the diagnosis of tuberculosis it is important not to be misled by the condition of the stomach and bowels. It often happens that there is, in addition to slight febrile disturbance, a little diarrhœa, with unhealthy-looking offensive motions, and loss of appetite. The attention is apt, therefore, to be directed entirely to these obvious points to the exclusion of the more serious affection of which they are merely accompaniments. In such cases a diagnosis can usually be made by inquiring whether the general symptoms preceded or followed the intestinal derangement. The influence of remedies is also an important guide. In the case of tuberculosis, the general symptoms continue after the condition of the bowels has become improved.

Causes.—Tuberculosis is a diathetic disease; in other words, it is the result of a constitutional tendency, more or less pronounced, to this particular form of pathological lesion. Of the children who are born with this constitutional predisposition a large number come of tubercular parents, or of families in which some members suffer, or have suffered, from the disease. It does not, however, follow that tubercular parents must necessarily have tubercular children. Such children may grow up without evincing any tendency to the disease, the predisposition either not having been manifested in them, or if present, having been effaced by the care and attention to hygienic rules with which the children have been reared. The tendency, whether hereditary or not, may be of itself sufficiently potent to give rise to the disease without the influence of any external causes to which such development can be attributed:

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[1] For a fuller description of this exceedingly common derangement, see the Chapter on Worms.

or it may remain latent until roused by circumstances to assert itself, and to produce its natural consequences. Of the children who become the subjects of this disease a certain proportion are descended from parents in whom no similar tendency is manifested, in families altogether free from the tuberculous taint. It seems probable, therefore, that the tuberculous diathesis can be acquired by children whose constitution is at birth entirely free from any such predisposition.

The exciting causes which may determine the development of this diathetic state consist of anything which interferes with the nutrition of the body, whether by preventing the introduction of nutriment into the system, or by obstructing the escape of waste matter whose removal is indispensable to the proper working of the different functions. In this respect it resembles syphilis and scrofulosis, the two other diathetic diseases of children. In them, too, the constitutional tendency, as yet latent, may be awakened by any cause which interferes temporarily with nutrition, and, therefore, lowers for a time the natural resisting power of the system against disease. Such causes are impure air, insufficient or improper food, cold and damp, want of sunlight and of exercise; a combination of these will in any case awaken the dormant tendency and excite its manifestations.

Certain diseases may also be the starting-point for the development of tubercle in subjects predisposed to the disease. Of these pneumonia may excite the formation of tubercle in the lung. No doubt many of the cases described as tubercle occurring as a result of pulmonary inflammation have been merely cases of scrofulous pneumonia, the so-called tubercle being the yellow infiltrated deposit which is the result of that special form of the disease; but this pneumonic consolidation may itself be the exciting cause of the formation of true gray tubercle in the tissue around it (see Pulmonary Phthisis).

Measles and whooping-cough are also often the cause of the tubercular manifestation, but seldom, according to MM. Rilliet and Barthez, except in conjunction with the other exciting causes which have been mentioned. In these cases it is especially the lungs and the bronchial glands which suffer from the presence of tubercle.[1]

[1] The question of the inoculability of tubercle has lately been the subject of investigation. The first experiments were made by M. Villemin, who laid the results of his inquiries before the French Academy in 1865. The investigations have been continued in England by Drs. Andrew Clark, Wilson Fox, Sanderson, and by Mr. Simon. From their experiments it appears that in the guinea-pig, or rabbit, the careful introduction of tuberculous matter under the skin is followed by the formation of a pathological product, which differs in no appreciable respect, according to Dr. Fox,[1] from ordinary gray tubercle, as that occurs in the human subject, either by its naked eye or microscopic characters, by its mode of distri-

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[1] See Lecture by Dr. Wilson Fox on the Artificial Production of Tubercle in the Lower Animals, delivered at the Royal College of Physicians, May 15th, 1868. Published in the Lancet for May 23-30, 1868.

Prevention.—If the mother is consumptive, she should on no account be allowed to suckle her child longer than the end of the first month; a healthy wet-nurse should then be provided to take her place. So much has been said in the present volume as to the feeding and general management of young children, that it will not be necessary to repeat in this place the different rules for the diet, clothing, etc., of infants, which have been already laid down. The reader is referred to the section containing the treatment of simple atrophy, and that on the prevention of diarrhœa, for full information upon these points.

The diet of an older child should also be so arranged that he may take as much as he can readily digest, but no more. Animal food should be given to him only once in the day, and should be either roasted or boiled: meat cooked a second time, as hashes, or stews, or meat fried in grease, are less digestible, and should not be allowed. After the age of two years a child should take four meals a day: of these, two should consist of bread and milk; a third of meat, finely minced at the first, afterwards cut into small pieces, with a little potato carefully mashed, and gravy; a fourth of farinaceous pudding, or an egg lightly boiled. The milk should, if possible, be fresh from the cow; if not, a tablespoonful of cream should be added. It is important to accustom the child early to masticate his food thoroughly: this point should be always attended to. Children often wake hungry in the early morning: it is well in such cases to place, overnight, a piece of dry stale bread, or a plain biscuit, by the side of their bed, so that they may not be forced to wait without food until their breakfast is prepared.

Well ventilated rooms, fresh air, and plenty of exercise have already been insisted upon. The skin should be kept perfectly clean by cold or tepid sponging over the whole body, in a bath, twice a day, and should be afterwards excited gently to act by friction with the hand, as has been previously recommended.

bution, the organs affected, or even the parts of the organs affected. Dr. Andrew Clark pointed out that, not only tubercle, but other matters non-tubercular would produce the same result; and Dr. Sanderson showed that even the local irritation excited by the introduction of a seton was as capable, under certain circumstances, of producing tubercle as any of the animal substances which had previously been experimented with.

With respect to the identity or non-identity with true gray granulations of the pathological appearances produced by inoculation, the experimenters differ. Dr. Wilson Fox advocates the view of the true tuberculous nature of these formations, grounding his opinion upon the fact that in the lung the point of departure is in no respect from the vascular apparatus, the new structure not being an infiltration of the alveoli, but a thickening of the wall of the air-cell which finally closes the vesicle. The air-cell, he states, is the last thing to be occluded, and, "even in the densest masses, examined with a binocular, a certain transparency can still be seen, distinctly in some places, showing that central portions of the alveoli are still hollow." Dr. Clark, however, maintains that these products, whatever they may really be, are at any rate not tubercular; for although *anatomically* they may resemble tubercles, *clinically* they differ from them in almost every particular. He believes that in determining the nature of a pathological product its clinical history is of infinitely greater value than its anatomical condition.

The dress should be warm, but loose: tight waistbands, and, in girls, stays, are exceedingly injurious. Nothing should be allowed to interfere with the free play of the chest. Pressure upon the ribs not only prevents a proper expansion of the lungs, but also is apt to cause displacement of the liver and stomach, and much derangement of the functions of digestion and respiration may be the consequence. "The only way," says Dr. Underwood,[1] "in which we can assist in forming a really fine figure, is to remove all restraint, and secure, as far as possible, so free an action to the muscles as will lead to their perfect development. By such a course we shall best promote the acquirement of a good carriage, which is infinitely more likely to be the result of a perfect balance of the muscles, than of any mechanical support whatever."

The preceding remarks do not refer to the abdominal belt, which should always be worn until the child is, at any rate, three years old. The band covers the belly, but does not confine the ribs, if properly applied round the upper part of the pelvis.

Children, both boys and girls, should be encouraged to exercise their muscles by out-door games, and by gymnastic exercises suited to their age and sex. While, however, plenty of fresh air and exercise out of doors are of such extreme importance, yet unnecessary exposure of children to cold winds and damp air, with a view of "hardening the system," is a practice which cannot be too strongly condemned. The most robust children are exceedingly sensitive to changes of temperature, and in cold damp air readily part with their heat, and become pinched and blue, showing that they are suffering from the effects of cold. Many an attack of inflammation of the lungs has been excited by such a practice, and in children already predisposed to tuberculosis, unnecessary exposure is one of the most certain ways of encouraging the tendency. A dry, airy situation should be always recommended. Dr. Buchanan[2] has shown that phthisis is much more prevalent amongst populations living on low-lying impervious soils, than amongst the residents of places more highly situated, and where the soil is pervious. In the selection of a house this is a matter, therefore, of considerable importance.

In children suffering from caries of bones, an early removal of the whole of the diseased bone is strongly advocated by Mr. Holmes. Tubercular disease of the lungs and internal organs is a frequent accompaniment of such a condition, and appears to be rather the effect than the cause of the bone disease. The complete removal of diseased bone may, therefore, prevent the occurrence of tubercular disease in children where a predisposition exists. The operation should be performed early. The child will then usually quickly recover, and often become strong and healthy.[3]

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[1] Diseases of Children, edited by Henry Davies, M.D. London, 1846.

[2] Tenth Report of the Medical Officers of the Privy Council. 1868.

[3] See Lancet, vol. ii., 1864, p. 236; vol. i., 1865, p. 59.

Treatment.—In the treatment of tuberculosis three things are indispensable. A free supply of fresh air, avoiding chills; a moderate amount of exercise, avoiding over fatigue; and plenty of nourishing food, avoiding repletion and indigestion. The child should pass as much time as possible out of doors during the day, returning, however, to the house before sunset, as the temperature often falls considerably at that time, and rapid changes of temperature are to be avoided. Cold is not so injurious as damp. These patients, if warmly clothed, often bear well, and are benefited by cold air; damp, however—at any rate the moist air of low-lying inland situations—is extremely prejudicial, and while the ground is wet the children should be kept in-doors, or should only be exercised with great caution. The moist air of the sea-side does not appear to be so injurious, and many cases of tuberculosis are greatly benefited by a residence near the sea. For the winter months, and in cases where a change of air is advisable, it often becomes a question of considerable difficulty to decide upon the best climate to which the patient can be sent. It may be laid down as a rule that the best climate for a patient suffering from tuberculosis is one where the temperature is as low as can be borne. A warm climate, unless in exceptional cases, is of no special advantage, and heat combined with moisture, as in Ceylon and Madeira, is, as a rule, positively injurious. A hot, moist climate is only of value in cases where there is excessive irritability of the bronchial mucous membrane, a condition which would be increased by warm dry air. In the earlier stages of tuberculosis this is, however, seldom a prominent symptom. The object of a change of residence in this disease is to obtain a climate where the patient can pass his time out of doors without incurring the risk of catarrh, and where, at the same time, the quality of the air is sufficiently invigorating. When the climate is damp as well as warm, the relaxing qualities imparted by the moisture usually cause so much depression, destroying the appetite and increasing the languor, as to counteract the benefit afforded by the more genial air. In determining this question regard should always be paid to individual peculiarities. Some children will require a much greater degree of warmth than others, and it will be necessary to take into consideration the influence which differences in temperature have already appeared to exercise upon the health of the patient—whether he has seemed to be more benefited by heat or by cold—before deciding in any case upon the exact climate which offers the best chance of recovery. For the special advantages afforded by different localities the reader is referred to the many excellent works upon this subject which have been published, and some admirable remarks upon the choice of a climate in the treatment of pulmonary consumption will be found in Dr. Fuller's work on the diseases of the lungs.[1] It may be remarked, however, that dryness of soil and protection from north and east winds during the winter and early spring, are essential in every case. The other conditions to be desired must be determined by the requirements of the particular case.

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[1] **Diseases of the Lungs and Air-Passages, by H. W. Fuller, M. D. Cantab., 2d ed., 1867.**

Moderate exercise while out of doors should always be enjoined, due regard being had to the degree of vigour of the patient. This is exceedingly important, as, unless the weather be warm, a proper action of the muscles is required to stimulate the circulation, and prevent the body being affected by the cold. Over fatigue must, however, be carefully avoided, and if there is any feeling of cold after a short stay in the open air it will be necessary to return at once to the house. If the child is strong enough, pony or donkey exercise should be recommended. In cases, however, where the exertion required for riding is too severe, an open carriage can be substituted, and the child can occasionally take a short walk, returning to the carriage when fatigued. Care must be taken that the child is perfectly warm before he leaves the house. If he is chilly when starting upon his airing, his power of resisting external cold is very much impaired. Different exercises should be devised by means of which the muscles of the arms, chest, and back may be brought into action. The use of dumb-bells, and of the elastic instrument known as the "chest-expander," is very serviceable in these cases; by such means the capacity of the chest may be very much increased, and greater freedom be given to the play of the lungs. Where the strength permits, all out-door games should be encouraged, care being taken to stop short of actual fatigue. Shampooing must not be forgotten; by this means the development of the muscles is aided, and the action of the skin is promoted. It should be practised every morning after the bath.

In doors, free ventilation must be sustained, while every care is taken to avoid draughts. In winter, it is important that the rooms should be kept at an even temperature, and that the passages should, if possible, be warmed. If this is impracticable, some extra clothing should be put on in passing from one room to another.

The action of the skin must be promoted by warm clothing, and by daily sponging with tepid water. In the early stages of the disease the cold bath, at a temperature of 60° Fahr., may be employed if its use is found to be followed by a proper reaction; if not, and the child remains languid and chilly, the temperature of the water must be raised. Tuberculous children should always wear a shirt and drawers of flannel next to the skin.

The diet of the child should be arranged as described under the head of prevention; four small meals being preferable to three larger ones in the day. Plenty of new milk is essential, and should always be given undiluted if it can be borne. Sometimes, however, in these cases there is a tendency to acidity of the stomach. This can be corrected by the addition of lime-water to the milk. On account of the debility of the digestive organs, which is so common in this disease, it is necessary to exercise great care in the selection of the diet. The simplest articles of food are the best, as plain roast beef or mutton, with gravy, mealy potatoes well mashed, milk, and strong beef or mutton tea, free from grease. Clear turtle soup is exceedingly digestible and nutritious. If eggs are allowed they should be given raw, and may be beaten up with warm milk. Too much farinaceous food should not enter into the diet, as it is apt to undergo fermentation and produce acid. Often, however, the appetite is very capricious, and there is a disgust for meat, and for the plainer articles of food, which it is very difficult to overcome. In such cases, frequent changes should be made in the diet, tempting the appetite with a small bird, as a quail or a snipe, with fish, as turbot, cod, or boiled sole, or with raw oysters. The addition of alcohol is often useful in stimulating the appetite: weak claret and water, or a large wine-glassful of light bitter ale, may be given to a child of six or seven years old, with one of his meals. The occasional administration of two or three grains of hydrargyrum cum cretâ with a little powdered rhubarb will often improve the appetite when that is failing, and dilute nitric acid in a bitter infusion, as infus. calumbæ, or a drop or two of dilute hydrocyanic acid, with ten grains of carbonate of potash, and half a grain of iodide of potassium, may be given three times a day in the same vehicle.[1] A most marked improvement in this respect is often effected by a change of residence to a dry bracing air, and where the patient is living in a relaxing situation this change should always be made if possible.

A careful watch must be kept over the condition of the bowels, for our hopes of improving the nutrition of the body depend entirely upon the accuracy of the performance of the digestive functions. Violent purgatives should be avoided; if there is constipation, an occasional dose of castor oil, or of decoction of aloes, will be sufficient to produce an evacuation. The most common condition is one in which the bowels are relaxed, three or four light-coloured offensive motions being passed in the course of the day. In these cases opium is a most valuable medicine, and should be given with dilute sulphuric acid, if the tongue is clean, as in the following mixture:—

℞.—Tinct. opii, ♏xxiv;
Acidi sulphurici aromat., ʒj;
Tinct. myrrhæ, ʒjss;
Syrupi aurantii, ℥j;
Infusi aurantii ad ℥vj.—M. ℥ss ter die.

or, if there is much straining, with mucus in the stools, and a furred tongue, it can be given with castor oil:—

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[1] All the prescriptions in this section are suitable to a child of five years old.

℞.—Tinct. opii, ♏xxiv;
Olei ricini, ʒiij;
Syrupi,
Mucilaginis acaciæ, āā ℥j;
Aq. menth. pip. ad ℥vj.—M. ℥ss ter die.

The flannel bandage should always be worn round the belly in these cases. The addition of two drops of tincture of capsicum to each dose of either of the preceding mixtures often renders them more efficacious. Capsicum is extremely useful in all cases of non-inflammatory diarrhœa in children, as it seems to exercise a powerful stimulating effect upon the internal surface of the alimentary canal. If the stools remain light-coloured after the motions have become more solid, a small dose of rhubarb with gray powder may be given to increase the secretion of bile.

Alkalies have been very strongly recommended by many authors, and—whether it is that they influence the oxydation of tuberculous matter, as suggested by some, or, as I am more inclined to believe, that their effect is merely upon the digestive organs, neutralizing any excess of acidity in the canal—there is no doubt that their use is often followed by considerable benefit. One of the best forms in which an alkali can be given is the mixture containing potas. bicarb., potas. iod., and dilute hydrocyanic acid, given above. Dr. George Buchanan recommends the citrate of potash, and states that he has often seen the most satisfactory results follow the use of this drug, "not at a distance of time, but in the course of three or four weeks' treatment."[1] Small doses of liq. potassæ with nitrate of potash may be given if there is any irritability of the stomach. When the digestive organs have been brought into a healthy state, cod-liver oil and tonics become necessary to continue the improvement, and are as beneficial at this stage of the disease as they would be injurious so long as there remains any functional derangement of the alimentary canal. Cod-liver oil is of immense service, but care must be taken to proportion the dose to the digestive power of the patient, for children vary greatly in their power of digesting fats. If more is given than can be digested, the residue passes unaltered through the bowels, and is apt to excite diarrhœa. At first, half a teaspoonful is a sufficient dose: it should be taken three times a day, after meals, in a little milk, orange wine and water, or, better still, in a cold infusion of orange peel. The dose can be afterwards increased, but the stools should be always examined from time to time for undigested oil. More than two teaspoonfuls three times a day can seldom be borne, and less than that quantity will often be found sufficient. When the oil is given with care, and not too early, it seldom disagrees. Should any temporary digestive disturbance arise, the oil must be omitted until this has subsided, after which it may be recommenced, but at first in smaller doses. In cases where the oil cannot by any means be made to agree, it may be administered by inunction into the skin. When, however, the stomach is delicate, the constant smell of the oil often excites so much nausea and discomfort, that the plan can seldom be continued for long together.

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[1] Lettsomian Lectures on the Diagnosis and Management of Lung Diseases in Children, Lancet, Feb. 1, 1868.

Sugar is strongly recommended by Dr. Fuller as a substitute for cod-liver oil, and may be taken by children in the agreeable form of sugar candy or barley sugar, *after meals*. If, however, it deranges the stomach and causes acidity, its use must be abandoned.

Under the head of tonics, iron takes the first place. It may be given as vinum ferri; liquor ferri pernitratis with dilute nitric acid; the ammonio-citrate; the potassio-tartrate; reduced iron (in doses of half a grain twice a day), or the syrups of the phosphate or iodide. If the syrup be objected to, the iodide may be conveniently given as in the following mixture:—

℞.—Ferri potassio-tartratis, ʒj;
Potas. iodidi, ℈j;
Aquæ destillatæ, ℥vj.—M. ℥ss ter die.

Iron has been objected to, as tending to produce irritation and congestion of the lungs and hæmoptysis. If, however, it is not given in too large doses, I have never seen any such effects in children follow its employment. On the contrary, where the condition of the stomach and bowels is satisfactory, its use has generally been followed with very great, if only temporary, advantage.

Besides iron, other tonics may be given; as quinia, which may be usefully combined with iron, as in the double citrate of iron and quinia (dose, five grains ter die, dissolved in glycerine); decoction of cinchona; tannic acid, either in a mixture with dilute nitric acid, or as the decoction of oak-bark; and the tincture of nux vomica. All these may be tried, and sometimes one, sometimes another, will appear to be beneficial.

CHAPTER VIII.

CHRONIC PULMONARY PHTHISIS.

CHRONIC PULMONARY PHTHISIS comprehends several distinct pathological processes—Infrequency of extensive pulmonary disintegration in young children—Symptoms—Physical signs—Their value—Anatomical characters—Gray and yellow tubercle—Scrofulous or epithelial pneumonia—Softening of consolidating material—Cavities—Fibroid phthisis.

Diagnosis.—Of tubercle—Of scrofulous pneumonia—Its complication with gray tubercle—Of fibroid phthisis—Diagnosis of cavities—From effusion into pleura—From dilated bronchi.

Prognosis.—*Causes.*

Treatment.—General—Special—Use of expectorants—Alkalies—Treatment of unabsorbed pneumonic deposits—Counter-irritation.

UNDER the head "Phthisis" are included many morbid conditions. The term includes not only those pathological changes due to the presence in the tissues of gray or yellow miliary tubercle, but also those extensive structural alterations which appear to belong more especially to the scrofulous habit of body—alterations which were once, and by many pathologists still are, attributed to tubercle, but which by others are considered to arise independently of it, and to be the result of distinct pathological processes.

Whether the term tubercle should bear the extensive application given to it by Bayle,[1] Laennec, and the French pathologists generally, or should be used only in the restricted sense in which Virchow and many modern observers are disposed to employ it, is a question, important enough in a scientific point of view, but of comparatively little moment to the practical physician. For him it is sufficient to ascertain the existence of a morbid material tending to soften, break down, and excite ulcerative action in the tissues around it.

In the present chapter it is intended to treat the subject clinically; to describe the disease phthisis as it appears to us at the bedside; to deal with the condition "wasting" as one caused by certain chronic changes in the lungs, whatever the causes of those changes may be.

Although gray tubercle is common enough in children, even in the youngest, and is found in the lungs indifferently with the other organs of the body, yet chronic pulmonary phthisis in the sense of extensive consolidation, softening, and excavation, cannot be considered a frequent disease, and is certainly rare under the age of six or seven years.

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[1] See issue for 1803 and 1805 of the Journal de Medecine of Corvisart, t. vi. ix. x.

Symptoms.—The symptoms of pulmonary phthisis are usually preceded by the general symptoms which have been described as accompanying tuberculosis. After these have continued for a variable time, special symptoms begin to be noticed.

One of the first signs showing that the lungs have become implicated in the disease is cough. In the beginning slight, dry, and short, it becomes after a time moister and more prolonged, occurring sometimes in fits like those found in whooping-cough, and this without any signs of enlargement of the bronchial glands. In such cases the fits of coughing occur in the morning on waking from sleep, and are due to a great accumulation of mucus in the bronchi, or in cavities formed by the softened tubercle, opposing the entrance of air into the minuter ramifications of the air-passages. However loose the cough may be, it is seldom, in children under seven or eight years old, accompanied by expectoration, unless vomiting occur, as such children invariably swallow the sputum as it reaches the mouth. If, however, the cough produces vomiting, large quantities of purulent mucus, more or less thick and viscid, may be expelled.

Hæmoptysis is a rare symptom, as the blood, like the expectoration, is almost always swallowed. Sometimes, however, it may occur in great quantities at the end of the disease, causing death. It is seldom seen except in cases complicated with great enlargement of the bronchial glands, and is then probably due to the glandular rather than to the pulmonary lesion. In infants a discharge of blood from the lungs never occurs at the beginning of the disease. In children of seven years of age and upwards it is seen, according to MM. Rilliet and Barthez,[1] in rare instances, but is never considerable.

The respirations are usually increased in rapidity, rising often to thirty, forty, or even more, in the minute. This acceleration is not necessarily accompanied by any feeling of dyspnœa, and in the chronic disease, unless the structural alterations occupy the greater part of both lungs, is seldom the cause of any discomfort to the patient. If the increased rapidity of breathing is accompanied by much fever, it will often be found to be due to the occurrence of some inflammatory complication, as bronchitis or pneumonia.

Vague chest-pains are sometimes complained of by children who are old enough to make their uneasiness known, and if complained of spontaneously, are of some importance. They seldom last long at a time, but disappear and return irregularly.

The position of the child in the bed offers nothing characteristic, as, unless the dyspnœa be extreme, he will usually lie indifferently on one side or the other without reference to the seat of disease.

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[1] Maladies des Enfants, vol. iii. p. 687.

Sometimes he is found to assume persistently some particular attitude; in such cases there is commonly a serious lesion on the side to which he is inclined.

When the disease is advanced the appetite often fails, but not always; it may continue good almost to the last, and the more chronic the case, the more likely is the appetite to be preserved. The amount of fever varies; the temperature is usually higher than that of health, although it may not remain at the same elevation throughout the day. It usually rises in the evening to over 100° Fahr., falling again towards the morning.

Attacks of diarrhœa are very common, and if appearing at a period subsequent to the commencement of the chest symptoms, and continuing obstinate in spite of remedies, are probably due to tuberculous ulceration of the bowels. The emaciation becomes more and more marked, and all the symptoms enumerated under the head of tuberculosis are aggravated.

The disease may last months, or even years, ending fatally in the great majority of cases. Death takes place either gradually without great aggravation of the symptoms; or preceded by much feeling of oppression of the chest, incessant cough, and more or less pain; or as a result of pneumothorax.

Physical Signs.—The physical signs of pulmonary phthisis result partly from the presence of tubercle itself, partly from the occurrence of structural changes, which may be set up by the tubercle, and are, therefore, secondary to it, or which may arise independently. The evidence obtained by inspection, percussion, and auscultation of the chest, shows merely the presence of consolidation of the lungs, of breaking up of the consolidating material, and the formation of cavities, without any reference to the pathological lesion by which these changes are produced. Whether or not they are due to tubercle is then a matter of inference to be decided by the seat, the course, &c., of these physical signs, and by other considerations which will be afterwards explained under the head of diagnosis. In infants there is seldom much solidification of the lung: tubercle, when it occurs, is scattered generally through the organ without producing any alteration of the percussion-note, or any auscultatory signs which can be looked upon as characteristic; the other lesions productive of chronic consolidation are in them exceedingly rare. In older children there is greater tendency to the grouping of tubercle, the other causes of consolidation are more common, and at about six or seven years of age the physical signs are very much the same as those found in the adult.

If the tubercles are sufficiently aggregated to give rise to physical signs, or if any other cause of solidification exists, it is usually at the apices of the lungs that the signs are best marked. In such cases we find more or less flattening on one or both sides under the clavicle, and inspiratory expansion may be diminished in degree. If the child speaks or cries loudly, vocal fremitus can be sometimes detected: this is a very important sign, for in health, on account of the quality of the voice in children, vocal vibration is so weak as to be almost imperceptible. When present, it is, therefore, evidence of very great value in the diagnosis of consolidation, while at the same time its absence is no proof that the lungs are healthy. On percussion there is dulness over the seat of disease. At the apices dulness is best detected in infants and young children at the supra-spinous fossæ, and can often be discovered at these spots when in front the percussion-note is perfectly healthy. Great care must, however, be taken to exclude all sources of fallacy in estimating the degree of resonance of the apices. One shoulder higher than the other, or a cramped position, bringing the muscles attached to the shoulder into action, will produce a dull sound on percussion which is not due to the condition of the lung. In infants, in examining the supra-spinous fossæ, it is advisable to place the child, stripped to the waist, on his mother's left arm, so that his head and right arm hang over her left shoulder, the left arm of the child being round his mother's neck. In this position the muscles of both sides are relaxed, and if the child remains quiet in that position, the results of percussion may be relied upon. Percussion should be made upon the two sides at the same period of the respiratory movement. Thus, if one side has been percussed during inspiration, it will be necessary to wait until another breath is taken before subjecting the opposite side to the same test. On account of the readiness with which false conclusions may be drawn with regard to the degree of resonance of the lung in children, it is best to require a considerable amount of dulness on percussion before making any positive inferences from the examination. Slight differences between the two sides should be allowed little weight, for a spot which appeared to be dull on one visit, may on the next seem perfectly healthy; the difference probably depending upon varying degrees of expansion of the lung-tissue at that spot.

The dulness, although usually situated at the apex in children, as it is in adults, is not necessarily so. The whole chest should be carefully percussed, both at the back and at the front. Dulness may be found in spots scattered here and there about the lungs, the percussion-note over the surrounding tissue being natural, or even abnormally resonant from emphysema. Broad percussion upon three fingers should always be practised in addition to the ordinary method, as dulness may be often detected by this means where percussion upon one finger alone gives no very positive result. Immediate percussion is also often useful, and Dr. Buchanan[1] prefers this method in thin children, to the use of the left hand finger as a pleximeter.

Of the varieties of the percussion-note little need be said. To the tubular note no importance can be attached; and the crack-pot-sound is a natural condition if the chest be percussed during expiration, when the mouth is open.

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[1] **Lettsomian Lectures on the Diagnosis and Management of Lung Diseases in Children, Lecture I., Lancet, Jan. 25, 1868.**

In practising auscultation in children, it is often recommended to apply the ear directly to the chest instead of using a stethoscope, on account of the uneasiness caused by the pressure of the instrument exciting crying. The advantages of such a course are, however, more than counterbalanced by its disadvantages. Owing to the small size of the thorax in children, and to the readiness with which, in them, sounds from the nose, the larynx, and the throat, are transmitted to the chest, it is extremely important to circumscribe as much as possible the limits within which the different respiratory sounds are perceived. If the instrument is spoken of as a "trumpet," children who are old enough to understand the term, seldom manifest much opposition to its use, especially if they are allowed to touch and play with it beforehand; and infants in whom the chest-disease is extensive, are often remarkably quiet during examination, being usually too much occupied by their own sensations to make any resistance to the operation. Over the seat of dulness, the respiratory murmur is found to be weak or suppressed, or is bronchial, blowing, or cavernous, with increased resonance of voice and cry. As the tissue softens and breaks up, moist crackles are heard accompanying the breath-sounds, or there is merely a click or two at the end of inspiration. This passes, as cavities form, into gurgling, or large bubbling rhonchus more or less metallic.

The stethoscopic signs differ in value according to the part of the chest at which they are heard. At the apices, mere harshness of respiration is insignificant, and prolonged expiration absolutely worthless, as a means of diagnosis. Bronchial breathing is a natural condition between the scapulæ over the site of the principal divisions of the air-tubes, and at the apices may be closely simulated by sounds conducted from the larynx. It is advisable that the child's mouth should be open during auscultation of the chest, the laryngeal sounds are then less readily transmitted. In the case of infants, however, this is not easy to manage.

Bronchial breathing, if heard at the supra-spinous fossæ, and supposing that conduction from the larynx can be excluded, is often the sign of a cavity. In the case, however, of bronchial, blowing, and cavernous breathing, enlarged bronchial glands in contact on one side with the air tubes, and on the other with the chest-wall, may, by their conducting power, simulate these varieties of respiration so closely, that at a single examination it is impossible to give a positive opinion as to the condition of the lung beneath. It is only by careful observation of the succession of these sounds that a conclusion can be arrived at. In the case of pulmonary consolidation and excavation, there will, as time goes on, be a gradual progression from harsh to cavernous breathing, while—if the sounds are due to conduction—cavernous, bronchial, and harsh breathing will be found to alternate irregularly with one another. The results of percussion often afford no assistance in these cases, for if much healthy lung intervene between the diseased spot and the surface, or if the disease has excited compensating emphysema around it, the percussion-note may be almost healthy.

All the signs of a cavity may be produced by extensive pleuritic effusion. The diagnosis between these two conditions will be given afterwards.

Bronchial breathing is most significant of solidification when heard at the base. If heard at the apex, in front or behind, conduction from the larynx and enlarged bronchial glands must be excluded before laying much stress upon this sign as evidence of consolidation.

Cavernous respiration at the base is very suspicious of a cavity; at the apex it is only valuable after exclusion of enlarged bronchial glands and pleuritic effusion.

In the case of disseminated miliary tubercles, the physical signs are very much more obscure. There may be absolutely nothing about the chest from which any information can be obtained; the resonance may be perfect, the respiratory sounds natural, and a little sonorous or submucous rhonchus heard here and there, showing the presence of an excess of secretion in the air-tubes, may be the only signs to indicate that the lungs are not in a condition of the most perfect health. At other times the submucous rhonchus may be more general, and may be heard from apex to base in both lungs; or sibilant and sonorous rhonchi may be equally extensively audible; or the respiration may be weak or harsh over a variable extent of lung-surface.

Weak respiration is of greater value, as evidence of tubercle, at the base than at the apex; but at a first examination too much importance should not be attached to it. If it is found to persist for several weeks, or if it occupies the whole extent from apex to base, on one side only, it becomes a sign of considerable significance. Harsh respiration is of little value unless it passes into weak respiration at the same spot, or unless the breathing is weak in intensity and harsh in quality at the same time; it then becomes of more importance.

Anatomical Characters.—The first stage in the anatomical changes depending upon pulmonary phthisis consists in the presence of solid bodies of variable size scattered through the lung, or collected into groups in one particular lobe. These bodies consist of gray or yellow miliary tubercle, and of the large masses resulting from scrofulous pneumonia—the infiltrated yellow tubercle of older pathologists.

Gray granulations are scattered through the lungs, but are usually in greatest quantity in, or may be even altogether limited to, the upper lobe. They occupy the septa between the air vesicles and the submucous tissue of the minuter ramifications of the bronchi.

Yellow granulations are also often disseminated through the lungs. They are not always the result of conversion of the gray; or at any rate small yellow bodies, distinguishable with great difficulty from degenerated gray tubercle, may be produced by other means. Such bodies may be the result of more or less extensive pneumonia occurring in scrofulous and tuberculous subjects. In this form of lung-inflammation, described by Dr. Andrew Clark as "epithelial pneumonia,"[1] the air vesicles are found to be filled up with a yellow matter, which is seen under the microscope to consist of large epithelium-like cells containing one or two nuclei, of the same cells in a state of disintegration, of free nuclei, and of granular matter. If isolated air vesicles are the seat of this inflammation, their contents are seen as small projecting bodies about the size of a millet-seed—larger, if contiguous vesicles are affected—yellow, hard, and resistant to pressure. When pricked, a yellow purulent-looking fluid sometimes escapes, if the formation is very recent. The coalescence of neighbouring vesicles, filled with the same material, produces masses of yellow cheesy-looking matter, which vary in size according to the extent of tissue involved in the inflammation. Every degree of bulk is therefore found between the solitary millet-seed bodies and extensive consolidation of an entire lobe, or even of the whole lung.

The masses may occupy any part of the lung. They may be seen on the surface as flattened plates, extending inwards for some distance into the substance of the organ, and having a notched, irregular circumference, or in the interior as rounded nodules. Surrounding them may be healthy tissue, or tissues occupied by smaller masses of the same kind, or by true gray tubercle. The solidified tissue may be at the base or apex, and in one lung or in both; usually only in one.

When a section is made of one of these masses, the surface is found to be dry, of a straw or gray colour, and sometimes marked with streaks or spots of black pigment. The fracture is granular, and the substance breaks down under pressure, the more easily in proportion to the newness of its formation; for as time goes on the material is found to become tougher and denser, less granular, and more opaque. Often the lobules, by coalescence of which the mass is formed, can be distinctly traced out, depressed intersecting lines being seen, which are the areolar partitions separating the lobules from one another.

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[1] Lectures at the Royal College of Physicians, 1866.

According to the views generally held, there are two distinct varieties of inflammation of the lung. One—the simple form of pneumonia—is accompanied by high fever, increased pulse-respiration-ratio, herpes on the lip (very commonly), and undergoes resolution from the seventh to the twelfth day. Here the deposit consists of cells similar in structure to the white corpuscles of the blood, and is believed to be composed of these white corpuscles, which have passed out of the vessels into the air-cells, either by rupture of the capillaries, as Dr. A. Clark considers, or by passage through the capillary wall, without rupture, as is held by other observers. When resolution occurs, these cells undergo retrograde metamorphosis and are absorbed, or expectorated.

The second variety—the scrofulous pneumonia of some authors, the epithelial pneumonia of Dr. Andrew Clark—occurs in scrofulous and debilitated subjects. Here the contents of the air-vesicles consist of large cells, exactly resembling epithelial cells in structure, containing one or two nuclei. This form is unattended by any sthenic inflammatory symptoms: the material is not absorbed, but softens, breaks down, and leads to ulceration and cavities.

The consolidation resulting from scrofulous pneumonia may be the only pathological condition found, or it may be accompanied by true gray or yellow tubercle. It is not uncommon to find the two conditions combined, for the presence of this form of pneumonia appears to be a determining cause of the development of true tubercle, which may then be looked upon as a secondary formation. Besides, the tubercle, originally uncomplicated, may excite inflammation in the lung tissue around it: its bulk will then be increased by pneumonic solidification forming at its circumference. Consolidation of considerable extent may, however, result from the aggregation of the tubercles in one part of a lung without the supervention of pneumonia. This usually occurs at the apex, and the detection of the true character of the consolidation is one of the most difficult questions in the diagnosis of pulmonary phthisis.

After the consolidation, tubercular or other, has existed for some time, certain changes take place in it. Of these, the most common is softening. The softening begins usually in the centre of the mass, whether that be large or small, and a communication being established with a bronchial tube, the softened matter is expelled, and a cavity results. The masses situated nearest to the apex are commonly the earliest to liquefy, but not always. Sometimes general softening appears to attack all the solidified patches of tissue, and the lung is then found to be riddled with abscesses which communicate with one another.

The cavities vary in size, according to the size of the mass which has undergone liquefaction. The smallest are about the size of a pea; the largest may be as big as an orange. If small, they are usually numerous: if large, the number is less. Sometimes a large cavity is seen, surrounded by smaller ones which communicate with it. If the cavity is situated in the interior of the lung, it is surrounded by solidified and softened tissue. If on the surface, it is covered on one side by the pleura, and unless adhesion takes place between the opposed surfaces of the pleura, perforation readily, results. Stretching across the hollow of the cavity are often seen slender bridges of lung-tissue, containing bloodvessels obliterated or still permeable. This is a condition much more common in the child than in the adult.

A lining membrane is usually described as belonging to cavities in the lung. Dr. Andrew Clark, however, believes this view to be incorrect. The wall consists of the ordinary tissue of the lung, loaded with tubercular or other matters. Of this diseased tissue, the innermost layer is in a state of disintegration, and can sometimes, although not always, be stripped off: hence the idea of its being a lining membrane. The secretion he believes not to be a real secretion, but to consist of the softened part of the disintegrated layer, which, becoming liquid, is expectorated. New infiltration goes on at the circumference of the wall of the cavity, and continued disintegration, producing more and more of the so-called secretion, on the inner side. If the infiltration is greater proportionately than the disintegration, the cavity becomes smaller, and may even almost close. If the disintegration is greater than the infiltration, the cavity extends.

It is the larger masses in the lung which are especially prone to disintegrate and soften down: the consolidation resulting from scrofulous pneumonia seems always to undergo this change. In the case of the gray and yellow granulations other alterations may take place. They may become inspissated by absorption of their watery parts, and remain as little opaque, grayish, hard lumps. This is not an uncommon change in the gray granulation. Or they may become cretaceous, being converted into small, dry, white masses, like bits of chalk. These two changes are equivalent to a cure; but although the local effects of the disease are thus rendered harmless, the disease itself may still continue, and new gray granulations may be seen surrounding cretaceous masses, showing that in spite of the local effort at repair the influence of the tubercular diathesis had remained as powerful as before. Even cavities sometimes, although rarely, close and cicatrize. In such cases, a fibrous nodule is found in the site of the cavity. It is usually small, of a whitish-gray colour, and has often fibrous bands radiating from it into the healthy tissue. The small bronchi are seen to end abruptly at the cicatrix, showing where they had been cut off by the ulcerating process at the time of formation of the cavity, The existence of the cicatrix is indicated, if it be near the surface. by puckering of the pleura over it.

Besides the pathological alterations which have been described, there is another variety of pulmonary phthisis, which is found in children as well as in adults. This is a form of cirrhosis, and is the condition to which, under the name of fibroid phthisis,[1] attention has been lately directed by Dr. Andrew Clark. The whole lung is diminished in size, and is adherent to the pleura. A certain portion—usually the lower part—becomes shrunken, dense, and slate-coloured. On examination, fibrous septa are seen passing in different directions through the diseased part: some horizontally, which seem to consist of obliterated vessels and bronchi thickened by adventitious fibroid tissue; others intersecting, which consist of true tissue, and occupy the interlobular spaces, ramifying in varying directions from them. These septa inclose portions of lung which contain yellow cheesy matter in a state of disintegration, or are broken up into cavities. The bronchial tubes are here and there dilated. In the very dense part of the lung the alveoli were found in several cases by Dr. Andrew Clark to be filled with "what seemed an amorphous substance, having occasionally an appearance of fibrillation."

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[1] Report on a Case of Fibroid Phthisis, by Dr. Andrew Clark, read before the Clinical Society, Feb. 14, 1868.

This condition of the lung may be complicated with true gray or yellow tubercle. It is often, however, a distinct disease, and may thus be only a part of a general disorder, the same fibroid changes going on in other organs, as the kidney, liver, spleen, &c.

Diagnosis.—The diagnosis of pulmonary phthisis is difficult or easy according to the amount of disease, the stage which has been reached, and the exact pathological condition which gives rise to the symptoms. We can readily detect consolidation, and can often determine the exact structural change to which consolidation is principally owing; but whether or not it is *entirely* due to this cause—whether other structural alterations may not be present to complicate the case—is frequently a question of the greatest difficulty to determine.

In all cases the great point to decide is the presence or absence of tubercle, for that may exist alone, or may accompany the other pathological conditions of the lung which have been described.

When tubercle exists alone, disseminated through the lungs, it is often, owing to the obscurity of the physical signs, impossible at the first, or even after several successive examinations, to come to any positive conclusion as to the exact nature of the disease. To arrive at a diagnosis we must take into account the family history, the special history, the conformation of body, and especially the course of the physical signs. Thus, if a child, born of consumptive parents, and whose general build corresponds to the type which has been described as significant of the tuberculous diathesis, becomes languid and mopes; if he has irregular attacks of febrile disturbance, loses flesh, has short, dry cough, and complains of vague pains and oppression about the chest, we should suspect phthisis. If these symptoms have succeeded to an attack of measles or whooping-cough, our suspicions are strengthened; but so long as percussion of the chest shows no dulness, and auscultation reveals nothing but harshness of respiration, with here and there dry rhonchi, there is nothing upon which to found a positive diagnosis. If the dry sounds become replaced by submucous rhonchus, there is still nothing which may not be accounted for by ordinary catarrh attacking a weakly child. If, however, the dry rhonchi persist and become general, being heard from apex to base, and if this condition continues without improvement for several weeks, and without moist sounds replacing the dry râles, the case assumes a very much graver aspect, and the diagnosis of phthisis becomes almost a certainty.

Such cases are, however, more common in the acute form of the disease. In chronic phthisis the tubercles have a greater tendency to become grouped at the apices, both lungs being affected. Here there is dulness on percussion and the stethoscope reveals weak or bronchial breathing, with often increased resonance of the voice or cry. The dulness, however, to be trustworthy, must be well marked: slight shades of variation from a healthy resonance being worthless as evidence of consolidation. Should the percussion dulness be distinct, and the breathing bronchial, with a slight crackle at the end of inspiration, these signs occurring at both apices, and continuing unchanged for two or three weeks, become satisfactory evidence of tubercular consolidation. On the other hand, absence of dulness is no sufficient proof of the absence of aggregated tubercle, for the resonance may be due to emphysema.

In cases where, from the ill-defined character of the physical signs, we had been obliged to reserve an opinion as to the condition of the apices, the occurrence of double pneumonia at those spots throws considerable light upon the difficulty, for inflammation coming on under such circumstances greatly increases the probabilities of tubercle.

The thermometer is of little value in the diagnosis of pulmonary tubercle: a continued elevation of temperature shows the presence of tuberculosis, but this elevation is, according to Dr. Ringer's[1] investigations, due rather to the general condition of the body than to the actual formation of tubercle in the organs, and affords, therefore, no distinct indication of the presence of tubercle in the lungs. It may strengthen our suspicions, but that is all.

In *scrofulous pneumonia* we can generally succeed in discovering a distinct period at which the first symptoms were noticed. A child, delicate, but in his usual health, is seized with an attack of vomiting, followed by fever, cough, and general chest symptoms. The strength is not much reduced, and breathing is but little oppressed, although it may be rather more hurried than natural.

If the child is seen early, no dulness may be found on percussion, but there is more or less coarse crepitation heard at a certain part of the chest, usually at one or the other apex—seldom at both if the disease is uncomplicated. The crepitation accompanies the expiration as well as the inspiration, and varies greatly in amount from day to day, sometimes more being heard, sometimes less, and sometimes for a short time it is completely absent. If any dulness is present, it is slight at first, and may not become more marked for several weeks; the breath-sounds are not necessarily altered in character. The temperature of the body rises at night to 102° or 103° Fahr., falling in the morning to about its natural level.[2]

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[1] On the Temperature of the Body as a Means of Diagnosis in Phthisis and Tuberculosis. London, 1865.

[2] On some Anomalous Cases of Phthisis, by Sidney Ringer, M. D. Medical Times and Gazette, Feb. 29, 1868.

After a time, often only after several weeks, the dulness becomes more marked, and then gradually increases in intensity and extent; the respiration is bronchial or tubular; and the coarse crepitation, persisting, is heard over the whole of the consolidated part, but varying in amount as before, and occasionally being replaced for a time by a rhonchus of larger size. Eventually cavities form; the percussion-note is then often tubular, and there is cavernous respiration with gurgling.

This pneumonia may affect any part of the lung, but it usually attacks the apex of one side, and is seldom found in both lungs—at any rate at first. It may last months or years.

Here we get a series of signs and symptoms which differ very markedly from those found in simple pneumonia. When the case is seen early, the slight amount of weakness, the small disturbance in the relation between the pulse and the respiration, the fall of temperature in the morning, and the persistence of the physical signs and the symptoms after the tenth or twelfth day, the time at which in simple lobar pneumonia resolution takes place; all these peculiarities show that the case is not one of ordinary inflammation of the lung. If the patient is seen for the first time at a later period, the disease may be distinguished from simple pneumonia by the length of time during which it has lasted. It is often, however, difficult to establish a distinct connection between the previous illness and the present symptoms, and the case may be one of simple pneumonia complicating an already existing disease. Under such circumstances, the fact of crepitation being heard over the whole of the consolidated surface instead of only at its circumference, the severity of the physical signs in comparison with the comparative mildness of the general symptoms, and the continuance of these, and of an elevated temperature, after the time when, in an ordinary case, resolution might be reasonably expected, will serve to furnish a distinction.

Between commencing scrofulous pneumonia of the apices and gray tubercular formation, the diagnosis is much less easy. The definite period of commencement would lead us to suspect the former disease, but so long as there are no very positive physical signs it is necessary to reserve a decision. Later, when the dulness has become established, and all the signs of consolidation are found, the want of correspondence between the physical signs and the general symptoms, the limitation of the disease to one side, and the history of the case showing the absence of preliminary failure of health, will be sufficient grounds for the diagnosis of scrofulous pneumonia. It is, however, by no means uncommon to find scrofulous pneumonia occurring as a complication of tubercle, and the presence or absence of tubercle is therefore an important question to decide in every case of pulmonary phthisis.

If the apices of the lungs are unaffected, tubercle may be excluded If the pneumonia attacks only one apex the presence of tubercl is doubtful; but if after several months the opposite apex still remains apparently free from disease, the only changes being an extension of the physical signs on the side first affected, the case is probably one of uncomplicated scrofulous pneumonia.

If both apices are the seat of inflammation, the presence of tubercle is probable, and if the double pneumonia succeed to already suspected tuberculous disease of these parts, it goes far to confirm the previous suspicions.

In *fibroid phthisis* the disease is limited to one side. The affected side is retracted, often considerably; the front of the chest is flattened, the respiratory movement slight, and the heart more or less displaced. If the disease occupies the left side the heart is drawn upwards, if the right side the heart is drawn towards the middle line. Real elevation of the heart must not be confounded with *apparent* elevation through unnatural obliquity of the ribs occurring in long-chested children. There is dulness on percussion over the seat of disease—usually the middle third of the lung approaching more or less to the apex. The note is often tubular, and there is unusual parietal resistance. Auscultation shows harsh, bronchial, or blowing respiration, with coarse rhonchus and increased resonance of voice, passing, as cavities form, into cavernous respiration, with gurgling and pectoriloquy. A systolic basic murmur is sometimes present, produced probably by pressure. There is seldom much febrile disturbance.

In extensive consolidation of the upper part of one side only, the other side giving no—not even the faintest—sign of disease, the diagnosis lies between scrofulous pneumonia and fibroid phthisis.

The existence of retraction of the affected side, the altered position of the heart, and the absence of fever, exclude the former disease. It is distinguished from chronic pleurisy with retraction by the resonance at the base, and by the signs of cavity.

Tubercle may exist in combination with this form of pulmonary phthisis, and should always be suspected "if the apex of the diseased lung is involved in the solidification." The probability is increased if there is moist crackling in the supra-spinous fossa, and "if, with the slightest dulness at the summit of the opposite lung, there is any moist crepitation, doubt is practically no longer possible." The above sketch of fibroid phthisis is taken from an abstract by Dr. Andrew Clark of his paper on that disease, read before the Clinical Society, Feb. 28, 1868. Dr. Clark's paper referred only to adults, but the disease is sometimes found in children of six or eight years and upwards. In this relation to them the subject has not as yet been thoroughly worked out, but there is no reason to believe that they are affected by it differently from their elders.

It is not always easy to satisfy ourselves as to the existence of a cavity in the lung, for, although present, it may give rise to no very positive signs, and, again, although absent, the physical signs usually indicative of excavation may be present.

In infants, and children of three or four years old, the signs of a cavity are often very obscure, consisting merely in bronchial breathing with submucous rhonchus and bronchophony. Here no positive opinion should be hazarded. It must be remembered, however, that at such an age ulceration of the lung is a rare condition.

In the case of older children a dull, tubular, or tympanitic percussion-note, with gurgling and bronchophonic resonance of the voice—signs usually indicative of a cavity—may be produced by dilated bronchi, and are occasionally very closely simulated in some cases of pleuritic effusion. In the case of this latter disease cavernous breathing, with large metallic bubbling rhonchus, and pectoriloquy, may be sometimes heard at the upper part of the affected side, and may then, if the disease is chronic, give rise to much hesitation, for excavation of the lung may be an accompaniment of the empyema. If, however, the opposite side is perfectly healthy, and especially if ordinary vesicular breathing can be detected at any point however limited, of the apex of the suspected lung, a cavity may be excluded.[1]

Between dilated bronchus and a cavity resulting from ulceration, the diagnosis is extremely difficult. The probabilities are in favour of dilated bronchi if the apex of the affected lungs appears healthy, and if the cavernous signs are heard at about the middle of the lung, and give the idea of several small cavities lying in a horizontal or diagonal line.[2] If the area over which the cavernous signs are heard gradually increases in extent, our suspicions point to a cavity, for dilated bronchi may remain unaltered for months. In all cases a careful examination of the sputum should be made with the microscope, if any expectoration can be obtained, to search for fragments of elastic tissue. Such fragments, if areolar, are conclusive evidence of ulcerative excavation.[3] In cases, also, of empyema, with suspected cavity, the presence of fragments of elastic tissue in the sputum will at once decide the question in favour of a cavity. It is necessary, however, to make many examinations of the same sputum before deciding against the presence of the elastic tissue.

Prognosis.—Pulmonary phthisis is generally fatal sooner or later, but its course from bad to worse is not always uninterrupted. Great caution should therefore be exercised in giving a prognosis, for a child who is apparently in the greatest danger may suddenly begin to improve, and his more serious symptoms may for the time completely disappear. Such amendment is apt to excite amongst his friends hopes, seldom destined to be realized, of a complete recovery.

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[1] Rilliet and Barthez, vol. iii. p. 680.

[2] Dr. A. Clark, *loc. cit.*

[3] Dr. A. Clark, in Transactions of the Pathological Society of London, 1855.

This improvement often happens in cases where the local symptoms are temporarily aggravated by a bronchitic attack, but it may also occur in cases of apparently uncomplicated gray tubercle. That permanent cures do occasionally take place is sufficiently proved by the presence of cretaceous tubercle, and cicatrices, in the lungs of children who have died from other diseases, and it is not so very uncommon to find recovery taking place in cases which present all the characters of acute tubercular formation. When, however, the chronic disease is once fairly established, the apparent improvement is almost always speedily followed by a relapse, all the symptoms returning with increased severity.

Pulmonary phthisis often lasts much longer than could be expected from the character of the physical signs. A child may continue in the same state without much improvement, or aggravation of his symptoms, for years, dying eventually of tubercular disease of some other organ, or even of a totally different complaint. It becomes, then, a question of much importance to decide in any given case upon the prospects of lengthened course, and such decision will depend in a great measure upon the presence or absence of gray tubercle. Uncomplicated scrofulous pneumonia is often very sluggish in its course; and if not extensive at first, may spread over the lung very slowly. It is, however, always liable to take on suddenly a more rapid course, and too great confidence should not be excited by the apparent inactivity of the disease.

Fibroid phthisis is still slower in its progress: in such cases the prognosis, so far as that can be founded upon the anatomical characters of the phthisis, is of all the varieties the least unfavourable.

In the case of gray tubercle, either alone or complicating the other varieties of pulmonary phthisis, very little hope can be given. The most favourable change appears to be its complication with fibroid phthisis: by this means life is often prolonged for a considerable time. The presence of tubercle in other organs, especially the bowels, is very unfavourable. Diarrhœa is not unfrequently the direct cause of death.

Death may take place suddenly, without being preceded by any great aggravation of symptoms. Usually, however, it is ushered in by increased severity of the cough, sensation of oppression about the chest, lividity of the face, increasing weakness, and all the signs of exhaustion. In a certain proportion of cases rupture of the lung takes place, producing pneumothorax: this is seldom recovered from.

Causes.—Of the causes of pulmonary phthisis, so far as that is the result of tubercle of the lung, nothing need be added to what has already been stated with regard to tuberculosis. Scrofulous pneumonia may, however, arise quite independently of any of the causes there mentioned.

Inflammation of the lung occurring in an unhealthy child is seldom simple. The deposit, instead of becoming absorbed, is apt to remain for a considerable time, then slowly to degenerate, and to cause ulceration and cavities, which spread until the whole lung, or the greater part of it, is rendered useless. Besides this there is, however, another means by which the same pathological condition may be set up. According to Dr. Andrew Clark,[1] certain dead animal products inserted beneath the skin of a rabbit will produce deposits, first in the lungs, and afterwards in other parts of the body. When the animal is healthy these become absorbed: when he is unhealthy, or being healthy is kept in conditions unfavourable to health, the deposits are not absorbed, but excite secondary deposits in other parts. The same thing will occur in the human subject: portion of septic matter, from whatever source, retained in contact with a living surface, may become absorbed, and may give rise to "secondary deposits in the lungs, to ulceration in the bowels, to clottings in vessels, and to poisoning of the blood."[2] Dr. Clark has shown that enlarged tonsils which retain their secretions are apt to become loaded with an offensive cheesy matter in a state of disintegration, and to give rise to a curdy, purulent discharge, streaked with blood. In the paper just referred to, Dr. Clark describes a case in which such tonsils were, with an orchitis, the probable cause of fatal scrofulous pneumonia. The pulmonary deposits resulting from the transference of these septic matters to the lung undergo disintegration, excite secondary inflammation around them, and set up the pathological changes which have been described.

In scrofulous children tonsils of the character referred to are not uncommon. They are, besides, subject to purulent discharges from the ears, nose, and vagina, to unhealthy ulcerations of the skin and mucous membranes, and to suppurations of the glands. It is possible that all of these may be sources from which absorption can occur to give rise to pulmonary deposits.

Treatment.—The directions already given in the preceding chapter, with regard to the prevention and treatment of tuberculosis, apply with equal force to the present disease. In the case of pulmonary phthisis there are, however, certain precautions which it is important to attend to. Thus, when the shape of the chest is elongated, and narrowed from before backwards, showing the small size of the lungs, every means must be taken, by exercises carefully proportioned to the strength of the patient, to increase the capacity of the chest, and invigorate the muscles of respiration. This is effected in a great measure by general exercise; but, besides this, the more special exercises, as the use of the dumb-bells and of the "chest-expander," are particularly valuable. Drilling, fencing, and other amusements which promote the acquirement of a good carriage, accustom-ing the child to throw back the shoulders and expand the lungs, are also of much service. The exertion should not, however, be too violent, or harm rather than good will result. Breathlessness, or a feeling of oppression about the chest, are signs of laboured pulmonary circulation, and should at once indicate repose. The child must be prevented from bending over a table in writing or drawing: he should be accustomed to stand at a desk, breast-high, while pursuing the occupations, so that the necessity for curving his body may be avoided. He should be taught fully to expand his chest, from time to time, by occasional deep inspirations; and singing or reading aloud are also advisable.

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[1] Lectures delivered at the Royal College of Physicians, 1866.

[2] See a paper by Dr. A. Clark, in the Medical Times and Gazette, May 23, 1868.

Fresh air is of the utmost importance, and daily exercise in the open air should never be neglected if the weather is not damp. If there is any keenness in the quality of the air, a respirator may be used to warm the air before it reaches the lungs.

In scrofulous children who are subject to inflammations and suppurations, and to caries of bone, early attention must be paid to these derangements. The child must be kept scrupulously clean, and any discharges from the ears, nose, or vagina, should be at once treated by suitable applications. Where disease of bone is positively ascertained, Mr. Holmes recommends early removal of the whole of the diseased bone; as internal remedies, such as cod-liver oil and tonics, although useful in improving the general health of the patient, yet appear to exercise no curative influence upon the local disease, and an operation becomes imperative.[1] For cheesy tonsils Dr. Andrew Clark[2] advises, in addition to general tonic remedies, alkaline applications to the throat, and gargles of tannin and alum.

The action of the skin must be promoted by daily sponging over the whole body with tepid water. When there is any reason to suspect consolidation of the lungs, cold baths must be forbidden. The shock produced by the first contact with the cold water at once drives the blood from the surface to the interior, and causes a sudden increase of the strain upon the vessels of the lungs, as well as of the other viscera. Pulmonary congestion may be produced by this means, and the danger of hæmoptysis is increased.

With regard to the question of climate, what has been said when speaking of tuberculosis applies equally well to the earlier stages of pulmonary phthisis. When, however, softening of the consolidating matter has taken place, and cavities have formed, a warmer climate is desirable; but even in these cases there are great differences in different patients, and some will require a much less degree of heat than others. Unless there be great irritability of the bronchial mucous membrane dryness of the air is of extreme importance, as a dry air, although warm, still possesses bracing properties.

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[1] Lancet, 1865, vol. i. p. 59.

[2] London Hospital Reports, vol. i. 1864.

If the lungs are very irritable, a certain amount of moisture is of service; and many places, both in England and abroad, are recommended for such cases. If, however, a suitable climate can be found in their own country, it is well not to send these patients too far from home: invalids feel acutely the absence of home comforts, and in the last stage of the disease especially, when little good can be hoped for from travel, it is cruel to send them away merely to die.

To improve the general condition of the patient the same measures must be adopted as have been already recommended for tuberculosis. Our first attention must be directed to the digestive organs, and afterwards, when these have been brought into a more healthy state, cod-liver oil, iron, and other tonics, will be of service.

With regard to the special treatment of the lung affection:—so long as there is fever, with dry cough or scanty expectoration, and tightness or oppression of the chest, stimulant expectorants are inadmissible. No lowering measures should be employed, it is true; but while, on the one hand, we should avoid all measures calculated to increase the depression of strength, we should not, on the other hand, be too eager to administer drugs the action of which would be to increase the irritation of a mucous membrane already in a state of active congestion. Opium, although it allays for the time the irritability of the bronchial tubes, is also unsuitable, for it diminishes expectoration, and the secretions would, therefore, remain in the tubes to be a source of continual irritation. In such cases we shall best relieve the engorged state of the lung by the administration of remedies tending to produce a copious secretion from the congested mucous membrane, as in the following mixture[1]:—

℞.—Liquor ammoniæ acetatis, ʒiv;
Potas. nitratis, ʒj;
Potas. bicarbonatis, ʒjss;
Sp. ætheris nitrici, ʒjss;
Aquæ carui ad ℥vj.—M. ℥ss tertiâ horâ.

At the same time the chest should be kept covered with hot linseed-meal poultices, frequently renewed; and the child should be confined to his nursery or bed-room.

After the cough has become looser, and the oppression of the chest has subsided, expectorants should be given with an alkali:—

℞.—Sp. ammoniæ aromat.,
Sp. ætheris nitrici,
Vini ipecacuanhæ, āā ʒj;
Pot. bicarbonatis, ʒj;
Infusi calumbæ ad ℥vj.—M. ℥ss sextâ horâ;

and afterwards, when the secretion is free, easily brought up, and the fever has disappeared, an astringent may be prescribed, with expectorants and a little opium:—

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[1] For a child of six or seven years old.

℞.—Liq. ferri pernitratis,
Acidi nitrici diluti, āā ʒj ;
Tinct. camph. c. opio, ʒij ;
Oxymel scillæ, ℥j ;
Inf. calumbæ ad ℥vj.—M. ℥ss ter die.

On account of the derangement of the stomach, which is so apt to be produced by even small doses of the nauseating expectorants, such as ipecacuanha and squill, it is advisable to combine them with tonics when the state of the patient permits. In this way they are better borne by the stomach, and cause less impairment of the appetite. The alkaline mixtures should not be continued too long: when the secretion is quite free, as shown by the looseness of the cough, the ease of expectoration, and the absence of fever, astringents are required to dry up the secretion, and give tone to the relaxed mucous membrane.

In cases where we have reason to believe the consolidation to be owing to unabsorbed pneumonic deposits, alkalies are also extremely useful. Dr. Andrew Clark[1] recommends a mixture containing bark, iodide of potassium, bicarbonate of potash, and ammonia, until the urine is alkaline. If there is much anæmia, he substitutes infusion of calumba for the bark, and adds a few grains of citrate of iron to each dose. The inhalation of sprays of weak solutions of bicarbonate, nitrate, or chlorate of potash, seem to have a very useful effect in promoting expectoration. A solution of bicarbonate of potash, ten grains to the ounce, may be inhaled in this way twice a day. At a later stage an astringent spray may be used, as three grains of tannin to the ounce of water.

Counter-irritation in children must be used cautiously, and is seldom necessary. So long as there is fever, with dry cough, &c., hot linseed-meal poultices are the best applications; and these, combined with the measures described above, soon relieve the more acute symptoms. Irritants applied to the chest appear to be most useful in cases where the consolidation is pneumonic in character. In such cases a liniment of croton oil (ʒj in ℥j of linimentum saponis) may be rubbed into a limited-spot twice a day till pustulation, and then once a day for a week. Dr. Buchanan states that he has used this method of counter-irritation to children under two years of age.[2] So long, however, as there is much heat of the skin, counter-irritants should not be employed.

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[1] See Lancet, Oct. 20, 1866, p. 439.

[2] Lecture I., On Diagnosis and Management of Lung Disease in Children. Lancet, Feb. 1, 1868.

CHAPTER IX.

TUBERCULIZATION OF GLANDS.

TUBERCULIZATION OF LYMPHATIC GLANDS.—Of glands in general.

OF BRONCHIAL GLANDS OR BRONCHIAL PHTHISIS.—Symptoms—Produced by pressure on neighbouring organs—Pressure on Veins—On Nerves—Physical signs—Alterations in respiratory sounds produced by pressure on trachea and bronchi—Modes of termination—Diagnosis.

TUBERCULIZATION OF MESENTERIC GLANDS OR MESENTERIC PHTHISIS (*Tabes Mesenterica*).—Symptoms—General—Local—Pressure on Veins—Ascites usually the result of peritonitis—Perforation of bowel—Diagnosis—Only to be made by feeling the glands—Diagnosis from fecal accumulations—From tubercle of omentum.

Anatomical Characters of Enlarged Tubercular Glands.

Treatment.

THE lymphatic glands often become the seat of tubercle, not only those which are external, but also those occupying the thoracic and abdominal cavities.

In children, the lymphatic glands are exceedingly liable to become enlarged from neighbouring irritation or inflammation, some irritating matters being conveyed into them by the lymphatics coming from the inflamed part. This is well seen in the case of impetigo of the head or face, when the glands of the neck, or those under the chin—according to the seat of the eruption—become actively congested, serum is poured out, lymph is exuded, and the size of the glands is increased.

In tuberculous children, active congestion of the glands tends to the formation of tubercle within them. If, then, after the cure of the primary disease, the enlarged glands remain large, and this increase in size persists for a long time, without any tendency to diminish, they are probably tubercular.[1] Such glands are oval or round, hard, uneven on their surface, and their outline is irregular. They are not tender, and the skin over them is colourless, and is not adherent. Occasionally they inflame without evident cause: the skin then becomes red; attaches itself to the gland beneath it; an abscess forms, bursts, and the tuberculous matter is expelled; after which the wound heals, or a small opening is left through which a discharge occurs from time to time. This spontaneous inflammation and suppuration of a chronically enlarged gland, should always lead us to suspect tubercle.

Sometimes several glands become enlarged and unite, forming a mass, the separate parts of which are connected by thickened and condensed cellular tissue.

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[1] Jenner on Tuberculosis, Medical Times and Gazette, Oct 26, 1861.

Glandular enlargement, then, is always an indication of pre-existing inflammation of the part from which the lymphatic vessels which pass through the gland have taken their origin, and if this enlargement continues a long time, it is strong evidence of tubercle. The same cause produces tuberculization of the bronchial and mesenteric glands; catarrhs or inflammatory affections of the lungs in the one case, and diarrhœa or intestinal irritation in the other, leading to the tuberculous condition.

While, however, in the case of tuberculization of the external glands, no other ill effects follow than those due to impairment of function in the glands themselves; yet in the case of the bronchial and mesenteric glands, other evils are induced. These bodies—inclosed as they are in cavities, and in contact with compressible organs—when enlarged, produce by their pressure secondary disturbances, which vary according to the organ whose function is thus interfered with, and according to the more or less yielding material of which the walls of the cavity are composed. Enlargement of the bronchial glands will thus produce more serious consequences—owing to the resisting parietes of the chest—than the same condition of the mesenteric glands which are confined by the more distensible wall of the belly.

TUBERCULIZATION OF THE BRONCHIAL GLANDS, OR BRONCHIAL PHTHISIS.—Tubercular disease of the bronchial glands is exceedingly common in consumptive children, as shown by post-mortem examination; but an amount of disease so great as to be detectable during life, is a condition much less frequently met with. In order to afford signs of its presence, the disease of the glands must be sufficient to produce considerable enlargement; for unless their size is so much increased as to produce derangement of function in neighbouring organs, the lesion is one which cannot be satisfactorily diagnosed.

Symptoms.—After a child has been suffering for some time from the general symptoms of tuberculosis, certain special symptoms begin to be noticed. These special symptoms may best be grouped according to the causes which produce them. Thus, the glands by their enlargement may press upon the bloodvessels, the nerves, and the air-passages.

Pressure upon the superior vena cava, or upon either innominate vein, interferes with the return of blood from the head and neck. As a consequence, we find dilatation of the veins of those parts, and more or less lividity of the face, neck, and upper part of the chest. A certain amount of heaviness and stupor may be produced by the interference with the return of blood from the brain; and, if the pressure be great, or the quality of the blood much impoverished, puffiness, or even œdema of the face may be found, first appearing, and being most marked about the eyelids. If only one of the innominate veins is exposed to pressure, the symptoms are limited to one side only. Enlargement of the veins of one side of the face and neck, with a permanent jugular vein on that side, should always lead us to suspect bronchial phthisis. The venous engorgement is especially noticeable during coughing.

If the congestion is very great, rupture of small vessels may take place, and bleeding occur from the nose or into the lungs. The former is common, but the latter is difficult to ascertain, for children almost invariably swallow blood coming up from the lungs. In a child the discharge of blood from the mouth during coughing, is seldom evidence of hæmoptysis. It is almost always the result of epistaxis, the blood flowing down into the back of the throat through the posterior nares.

When the nerves passing through the chest are compressed, one of the earliest indications of such pressure is a peculiar character of the cough. The cough becomes spasmodic, occurring irregularly in paroxysms like those of pertussis, lasting only a short time, and ending sometimes, although rarely, in a crowing inspiration. There is seldom any vomiting. Sometimes the cough is hoarse and dry; at others it is moist with a rattling of mucus; at others again its quality is unchanged, and presents nothing to attract attention.

The voice, like the cough, may be altered in character, but not usually, unless the disease is far advanced. It may become hoarse or thick, or even partially extinct, and these different conditions frequently alternate with one another.

Violent attacks of dyspnœa occasionally occur, and may assume all the characters of asthmatic seizures; the face becomes livid, the countenance anxious, and the skin cool and damp. Asthma in young children not unfrequently owes its origin to this condition of the bronchial glands. Attacks of spasm of the glottis sometimes are noticed; according to Dr. Ley,[1] laryngismus stridulus is constantly produced by this cause.

Physical Signs.—The enlarged glands are seated at the bifurcation of the trachea, and therefore behind the first bone of the sternum. On percussion there is dulness at that spot, which may extend to a variable distance on either side, and below. It sometimes reaches from the sternal notch as far as the base of the heart. Occasionally there is dulness also between the scapulæ, but this is not always found, on account of the thickness of lung which lies between the glands and the posterior wall of the chest. If any enlarged glands lie underneath the anterior margins of the lungs, a "crack-pot" sound may be heard on percussion over the first three ribs. This, however, on account of the natural pliancy of the chest-walls in children, is a common circumstance, and is not necessarily a sign of disease.

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[1] London Medical Gazette, 1834.

The auscultatory signs are due partly to the effect of pressure of the enlarged glands upon the trachea and bronchi; partly to the unnatural distinctness with which the breath-sounds are conveyed to the surface, for an artificial medium of conduction is formed between the tubes and the wall of the chest.

Pressure upon the lower part of the trachea produces during respiration a loud snore, which differs in character from the ordinary sonorous rhonchus, and may be frequently heard at a distance from the chest. It is sometimes intermittent. Upon either bronchus, pressure, if considerable, causes weakness of the respiratory sound in the corresponding lung, especially at the base, for a certain amount of collapse of the inferior lobes of the lung may take place with sinking in of the lower part of the thoracic wall at the side.

If there is no pressure, but the glands adhere closely to the bronchi on one side, and to the chest-wall on the other, the breath-sounds are tubular with long ringing rhonchus, in front, and also sometimes between the scapulæ behind; powerful quasi-pectorloquous bronchophony may also be produced.[1]

At the supra-spinous fossæ the sounds may be weak, bronchial, or even cavernous, and these different conditions may alternate irregularly with one another. A hum is sometimes heard over the position of the descending vena cava from pressure upon the vein; and compression of the pulmonary artery produces a systolic murmur heard at the second left interspace.

The symptoms of bronchial phthisis are blended with those of the general disease, and are often marked by more prominent symptoms due to the same disease of other organs, especially of the lungs. The combination of pulmonary with bronchial phthisis is very common, and the physical signs of the former disease are often perverted and exaggerated by this condition of the glands, as has already been described.

Softening of the enlarged glands may take place, and a communication be set up with the lung, producing pneumothorax; or with a large vessel, giving rise to fatal hemorrhage. These methods of termination are, however, rare. Death usually takes place with aggravation of the preceding symptoms, and is not unfrequently hastened by accompanying pulmonary phthisis.

Diagnosis.—In a well-marked case the signs of pressure upon the veins, the dulness over the first bone of the sternum extending to a variable distance on each side, and the paroxysmal cough, point conclusively to bronchial phthisis.

Before any signs of pressure exist, and before the size of the glands is increased sufficiently to give rise to alteration of the percussion-note, the only symptoms observable are those of tuberculosis, and present nothing characteristic. The first symptom leading to suspicion is usually the peculiarity in the cough. This is distinguished from the cough of pertussis, which it so much resembles, by the absence of crowing, and of the terminal vomiting, or glairy expectoration. Such a cough, if unaccompanied by the auscultatory signs of pulmonary disease, is very distinctive of enlarged bronchial glands. The absence of these auscultatory signs is very important in the diagnosis, as a morning cough of very similar character is occasionally heard in cases of pulmonary phthisis with excavation of the lung, and is sometimes also a characteristic of broncho-pneumonia. If in the interval of fits of coughing there is anything approaching to an asthmatic seizure, or the slightest percussion-dulness at the top of the sternum, little doubt can remain as to the nature of the disease. Alteration in the quality of the voice often accompanies the characteristic cough. If there is doubt in any case, the occurrence of signs of venous pressure at once changes our suspicions into certainty.

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[1] Walshe on Diseases of the Lungs. Art. Bronchial Phthisis.

MESENTERIC PHTHISIS.—Tubercular disease of the mesenteric glands, or tabes mesenterica, is very far from being a common disease; at any rate it is rare to find enlargement of these glands so great as to be discoverable by the touch, and unless they can be *felt*, it is impossible to say with anything approaching to certainty that they are enlarged at all. Unless enlarged, their influence upon general nutrition is probably insignificant, for although they may not be quite healthy, yet they are no doubt sufficiently so to carry on their functions with more or less completeness, and therefore if no increase in size can be discovered, their consideration may be passed over, as far as regards prognosis or treatment of the patient.

Symptoms.—The *general* symptoms are those belonging to the general disease, for the mesenteric glands are only one of many organs the seat of tubercle, although they may be more profoundly affected than other parts of the body. There is usually emaciation, as there is in all cases where tubercle is present, but it is not more marked than when other organs are more prominently affected. The appetite is good, sometimes unusually keen. Thirst is moderate. The tongue is pale, clean, and often slimy-looking, and there may be diarrhœa, especially if, as often happens, tubercular ulceration of the bowels is a complication of the disease. Vomiting is a rare symptom.

The *local* symptoms are the only ones of any value in the detection of tabes. The belly is at first unchanged in shape, and even as the disease advances does not necessarily become more prominent. On the contrary, the abdominal wall is often retracted, and when swollen it may be soft and easily depressed, although it is apt to become tense at times from the accumulation of flatus in the bowels. The wall may also be tense when the size of the glands is very considerably increased. The degree of tension of the parietes is very important, as regards the detection of the enlargement. If the tension is very great, a moderate enlargement may escape notice, owing to the resistance of the abdominal walls, which will not allow the glands to be reached by the finger; and a tumour which can be easily felt at one visit may the next be completely concealed by the abdominal inflation, so as to be no longer detectable by the touch.

The situation of the tumour is about the umbilicus; the swelling is irregular to the feel, and hard. Its size varies, but may be as large as a fœtal head. When the mass is large, it can best be detected by pressing the abdominal wall inwards towards the spinal column. When small, Sir William Jenner[1] recommends that the parietes should be grasped by the fingers and thumb of one hand, or between the fingers of the two hands, and pressure thus be made laterally, from the side towards the centre, so as to seize the tumour between the fingers. By this means a swelling the size of a nut can be felt, if the wall is flaccid. The glands are sometimes slightly movable, if the enlargement is not sufficiently great to involve the mesentery in the swelling.

There is usually more or less tenderness on pressure, but the tenderness is not necessarily a sign of inflammation of the diseased glands, for it is found in cases where no trace of inflammation is discoverable on a post-mortem examination.

When the glands reach a considerable size, they may press upon neighbouring parts so as to produce secondary derangements. Thus, pressure upon the nerves may cause cramps in the legs. Compression of the large venous trunks may give rise to œdema of the lower limbs and dilatation of the abdominal veins. If this venous dilatation is very marked, the superficial veins being seen to ramify upon the abdominal wall, and to join the veins of the chest-walls, tabes should always be suspected in the absence of chronic peritonitis or enlargement of the liver.

Ascites is not necessarily a result of the tuberculization of these glands, and is rarely produced by direct pressure unless the portal vein is compressed by enlargement of the glands occupying the hepatic notch. It may, however, be produced in a different way: thus, friction of the enlarged glands against the peritoneum lining the abdominal wall may cause inflammation of that membrane. In these cases there is some fever, with increase of abdominal tenderness, and colicky pains. The belly becomes tense from gaseous distension of the intestines; and indistinct fluctuation is often felt from adhesion of the bowels one to another, with the addition of a little serous effusion between the coils. Vomiting is not constant, and diarrhœa, if previously present, is not interfered with. The amount of ascites is in these cases not very great, and the symptoms of peritonitis generally are far from being well marked.

Adhesion may take place between an enlarged mesenteric gland and a coil of intestine: when the gland softens, perforation of the bowels may result.

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[1] Lecture on Tuberculosis. Medical Times and Gazette, October, 1861.

The course of the disease is slow, but its duration is difficult to estimate, on account of the obscurity of the earlier symptoms. It seems to occur more frequently in boys than in girls, and is seldom found in children under three years of age: most commonly between the fifth and tenth years. The children do not necessarily die; they sometimes recover.

Diagnosis.—The diagnosis of tabes mesenterica can only be made satisfactorily by the sense of touch. If we can hold the mass between the finger and thumb, proof of its presence is indisputable, and this proof is the only one which leaves no doubt upon the mind. Enlargement of the belly is no evidence of the glandular disease, for flatulent distension is in children a common accompaniment of ill health, and in tabes the abdominal wall is more often retracted than expanded. Wasting, again, is found in almost all chronic disease, tubercular or otherwise; and diarrhœa is a symptom by no means confined to tabes. These symptoms may be present, but they are not a result of the tubercular lesion of the glands, and either alone or combined are useless as indications of the disorder under consideration.

If, as has been said, the superficial veins are distinctly seen to ramify on the abdominal wall, and to join similar veins on the thoracic parietes, tabes should be suspected, but nothing more than suspicion is allowed by such evidence. Any interference with the portal circulation will produce the same result, and when the abdominal wall is tense it is difficult to exclude hepatic disease.

Even when by direct exploration the existence of a tumour in the belly has been ascertained, we have still to satisfy ourselves that the tumour is formed by enlarged mesenteric glands. The disease may be simulated by fecal accumulation in the colon, or by tubercular masses attached to the omentum.

Fecal accumulations are distinguished by the absence of tenderness; by the situation of the tumour, which usually occupies the transverse or descending colon instead of the umbilical region; and by the shape of the mass, which is elongated, the long axis being in the direction of the long axis of the bowel in which it is contained. In doubtful cases, a positive opinion should be reserved until the effect upon the swelling of a good injection has been tried. For a child of four years old, an enema[1] of a pint or more of soap and water, or thin gruel containing half an ounce of oil of turpentine and four ounces of olive oil, should be thrown up the bowel by a good syringe. The injection should be retained for a few minutes by firm pressure upon the anus, and then be allowed to escape. If the tumour is due to fecal accumulation, a quantity of pale brittle lumps will be discharged with the returning fluid, and the swelling previously noticed in the belly will be found to have disappeared. If tuberculized glands are the cause of the tumour, the evacuation of gas and fecal matter will only make the presence of the enlargement more manifest, by removing the tension of the abdominal wall, and allowing of more efficient exploration of the cavity of the belly. In these cases an enema of sufficient quantity to distend the bowel is of more value than any number of aperients. It is well, also, to remember that fecal accumulation having once occurred, there is great liability to a second collection of the same kind, therefore for some time afterwards a careful watch should be kept over the condition of the bowels.

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[1] Jenner on Tuberculosis, Medical Times and Gazette, October, 1861.

Between tubercular masses attached to the omentum and tubercular mesenteric glands the distinction is often very difficult, particularly if the seat of the tumour happens to be the umbilical region. When their seat is the omentum the masses are more superficial, are less nodular, and have better defined edges than is the case where the glands themselves are diseased. They are usually also more freely movable.

In a case mentioned by MM. Rilliet and Barthez[1] a cancerous pancreas offered some resemblance to the tumour of tabes mesenterica, but was distinguished, amongst other signs, by presence of vomiting, jaundice, and abdominal pains.

Anatomical characters of enlarged tubercular glands.—The formation of tubercle usually begins in the centre of the gland, and from this point the morbid change spreads gradually towards the circumference. Occasionally, however, several distinct points of tubercle are seen at different parts of the same gland; these may increase in size, and approach one another until the whole gland is converted into tubercular matter. The colour of the diseased gland is usually yellow, but sometimes a gray point is seen in the centre, surrounded on every side by the yellow mass.

The glands are not all equally affected. Some remain perfectly healthy while others are diseased; some which are diseased remain small, while others undergo considerable enlargement.

The alteration in these glands consists, according to Virchow,[2] in a great increase of their cell elements with not unfrequently hypertrophy of the connective tissue. The cells become large, round, tough, transparent, finely granular, and contain one or two large nuclei. They have a great tendency to undergo degeneration by fatty change. A gland so altered is seen at first as a large spongy-feeling body; its colour is reddish, passing, where the fat change is much advanced, into a dirty, opaque-white colour. If there is much hypertrophy of the connective tissue, the glands become very hard. After a time the whole gland becomes thick, tough, anæmic-looking, and dry, quickly transforming into a yellow, opaque, cheesy mass.

The capsular vessels become enlarged, and the capsule itself thicker and divisible into two layers.

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[1] Maladies des Enfants, vol. iii. p. 817.

[2] See Gulstonian Lectures on the Nature and Affinities of Tubercle, by Reginald Southey, M. D. Oxon. London, 1867.

After a time the glands soften; the softening process usually begins at the centre, although isolated points at the circumference may first undergo this change. These, on section of the gland, are sometimes seen to be connected by prolongations of softening with the softened centre. Evacuation of the liquefied matter may eventually take place, a communication being formed with some neighbouring organ.

The tubercle sometimes becomes cretaceous, as it does in other organs.

In *bronchial phthisis* the glands lying at the bifurcation of the trachea are usually the most enlarged. Those accompanying the bronchial tubes into the interior of the lung are less increased in size, although they may be seen larger than natural as far as the third or fourth division of the bronchial tubes. A mass formed of these enlarged glands may occupy the anterior mediastinum, extending from the base of the heart to the top of the sternum.

In *mesenteric phthisis* the glands often unite to form an irregular nodular mass as large as the fist, or even larger. The mass is situated in front of the vertebral column. If the mesentery is involved, the tumour is fixed; if the mesentery is free, the mass can be moved a little to one side or the other.

Treatment.—On account of the readiness with which the lymphatic glands, both internal and external, become enlarged in tuberculous and scrofulous children, it is of great importance to remove as quickly as possible any local irritations, the continuance of which would lead to the glandular disease. All purulent discharges, skin eruptions, and ulcerations of the skin and mucous membranes, must therefore receive prompt attention. "Little colds" must not be neglected, as disease of the bronchial glands is produced by pulmonary irritation; and the danger of tubercular enlargement of the glands of the mesentery is an additional reason for keeping a careful watch over the condition of the stomach and bowels.

In bronchial and mesenteric phthisis the general measures to be employed are the same as those already recommended for the treatment of tuberculosis. Cod-liver oil is said to be of especial value in these cases, and should be given with the precautions previously enjoined.

In the case of *bronchial phthisis*, counter-irritation should always be adopted, either in the form of pustulation with croton oil, or, for children of six or seven years old, by the application of a blister of the size of a two-shilling piece, which must be kept open for some time. The counter-irritant should be applied to the upper part of the sternum in front, and between the scapulæ behind, alternately. The internal use of iodide of iron is also strongly advocated. The syrup of the iodide may be made use of, or a mixture containing half a grain of iodide of potassium, and five grains of potassio-tartrate of iron, in half an ounce of distilled water, three times in the day. The quantity of the iodide of potassium may be gradually increased.

For *mesenteric phthisis*, the ointment of iodide of lead may be rubbed into the belly twice a day, and iodide of iron should be given internally as recommended above. Should peritonitis occur, hot linseed-meal poultices applied to the belly, and opium given cautiously by the mouth, form the best remedies. The diarrhœa which is so frequent an accompaniment of the glandular disease should be arrested as rapidly as possible. For the treatment of this complication the reader is referred to the chapter on Tuberculosis, and that on Chronic Diarrhœa. Small enemata of warm starch containing five or ten drops of tinct. opii are very useful in these cases. Unfortunately the diarrhœa is, in many instances, the result of accompanying tubercular ulceration of the bowels; if so, all our efforts will prove of little avail in retarding the fatal termination.

ADDENDUM.

ON THE DIGESTIVE DERANGEMENT ACCOMPANYING THE SECOND DENTITION.

(*From the London Lancet,* June 5, 1869.)

In children, the activity of the mucous membrane lining the alimentary canal is very remarkable. The secretion of mucus appears in them to be always in excess, as compared with the adult, and to be abundantly increased by the presence of the gentlest irritant. The stools of young infants are, in their natural state, composed in great part of mucus, and under the influence of any passing irritation this secretion becomes largely augmented; the stools consisting of that more or less intimate admixture of thick viscid mucus with fecal matter which is known in nurseries by the name of "slime." In infants improperly fed, and whose bowels are therefore exposed to the constantly renewed irritation of undigested food, great quantities of mucus are often found in the motions in the form of strings and jelly-like lumps.

Again, the increased secretion of mucus may be the result, not of local irritation, but of sympathetic action set up in one tract of mucous membrane by the existence of a similar condition in an adjacent tract. Thus, in hooping-cough the stomach and bowels sympathize with the copious mucous flux of the bronchial mucous membrane, and themselves secrete an abundant thick mucus, which is vomited in large quantities at the termination of the characteristic cough, and is discharged from the bowels with the stools. After recovery from hooping-cough the derangement of the alimentary canal usually subsides; but in weekly children, or in children much reduced by the intensity or the long continuance of the disease, the excessive secretion of mucus is apt to continue, and to become chronic.

A chronic derangement of this kind is very frequently met with, and, by its influence in impeding general nutrition, often excites suspicions of the existence of tubercle. It is often found to accompany the progress of the second dentition; for although by no means necessarily excited by that state of natural development, yet there is no doubt at such times—owing to the intimate sympathy existing between all parts of the alimentary canal—a great tendency to increased activity of secreting function, and an increased susceptibility to disturbing influences.

A child in whom this derangement exists is noticed to be languid and dull; he is disinclined to exertion, and complains of weariness and depression. He grows pale; loses flesh; his skin gets dry and rough, so that by friction the epithelial scales can be rubbed off as a fine dust. He is often drowsy in the day, but is restless at night, grating his teeth; and his sleep is frequently disturbed by frightful dreams, from which he wakes in great terror, crying or talking incoherently. Nocturnal incontinence of urine is also not unfrequently complained of, and this, although in the beginning only occasional, may afterwards become habitual. His appetite, at first unusually keen, becomes gradually capricious, then fails almost entirely, and each meal is followed, after some little interval, by flatulence and uneasiness. The appetite may, however, remain large even after the emaciation has become extreme, and in some cases the hunger seems almost insatiable, the child very shortly after a full meal asking again for food. The tongue is either deep-red, clean, and glossy, looking as if denuded of its epithelium, or is covered with a thin coating of transparent gray fur, with a slimy look, as if it had been soaked in mucilage, and having the fungiform papillæ at the sides of the dorsum, although not elevated, unusually large and well defined. The bowels are either constipated, or there are frequent scanty stools, containing large quantities of free mucus; and the evacuations are generally accompanied by much straining, and sometimes by prolapse of the bowel. It is not uncommon to find constipation and diarrhœa, alternating with one another. Thus, the bowels are confined for two or three days, or even for a whole week; a violent attack of purging then sets in, the bowels being opened ten, twelve, or even more times in the twenty-four hours; after which, the accumulation having been discharged, the bowels become again confined. Sometimes the breath is extremely offensive, especially in the mornings; and this is often dependent upon enlarged tonsils, which secrete a thick, bad-smelling, semi-purulent matter. The fetor of the breath may, however, be present although the tonsils are quite healthy. The complexion is often remarkably sallow, having a half-jaundiced tint; and the child complains of headache or of wandering pains about the chest or belly. The lymphatic glands of the neck are liable to become enlarged on the slightest irritation. They do not, however, necessarily suppurate or remain permanently swollen. The enlargement, after persisting for a variable time, may disappear completely. Night-sweating is a rare symptom; indeed, the skin is habitually too dry, and acts with very great difficulty. The temperature of the body is seldom elevated above the normal level.

The symptoms thus described do not progress in any regular manner from bad to worse. It is usually found that the child is subject every few weeks to what are called "bilious attacks"—to violent attacks, that is, of vomiting and purging, lasting often for two or three days, during which large quantities of mucus are got rid of. The system being thus relieved, the symptoms become for the time less severe; the child sleeps better at night, and during the day is less languid and more inclined to take exercise. The improvement is not, however, of long continuance; for the symptoms, returning, grow gradually worse until they culminate in another violent attack like the former. In this way the child may go on for months, getting gradually thinner and weaker, his condition exciting the gravest apprehensions amongst his relatives, especially as a short hacking cough is a not unfrequent symptom of this derangement, and increases their fears of the outset of consumption.

Worms, especially amongst the poorer classes, form a common complication of this derangement; in which case the symptoms are all attributed to the presence of the entozoa. The creatures find in the alkaline mucus a congenial nidus; but the disorded state of the mucous membrane is at least as important as are the parasites themselves, and until the alimentary canal is restored to a more healthy condition, special anthelmintics frequently fail of success. The difficulty so often experienced in curing a child of worms is due to a neglect of the measures necessary effectually to restrain this unnatural activity of the mucous glands.

It is easy to understand how nutrition must suffer in this disease. The mucus poured out into the stomach and bowels seems to act as a ferment, and to cause decomposition of the food with which it comes into contact. At the same time the alimentary masses, being enveloped by a coating of thick slimy matter, are prevented from being properly mixed up with the digestive fluids. A comparatively small part of the food which has been taken is therefore converted into a form in which it is capable of being absorbed; and of that small part a still smaller is actually taken up by the absorbent vessels, on account of the thick layer of viscid mucus which lines the walls of the bowel, and prevents the veins and the lacteals from performing their functions. The acid resulting from the fermentation of starchy food increases the consistence of the mucus by partially coagulating it; and the irritating action of the sour contents of the bowel upon the lining membrane excites further secretion from the glands. The large appetite so commonly found in these cases is, no doubt, in part a manifestation of the want of nourishment felt throughout the system; but it is probably also in part a morbid craving excited by the stimulating action of the fermenting contents of the stomach and bowels.

The symptoms by which this derangement may be recognized are: the slimy appearance of the tongue; the large quantities of free mucus in the stools; the great want of regularity in the progression of the symptoms; and the periodical occurrence of "bilious attacks." If these conditions are observed to follow an attack of hooping-cough, or to occur at the time of the second dentition—if they are accompanied by dry, rough skin, and sallow complexion—and if the temperature of the body is not raised above the natural level—we may conclude that the illness is due to the cause which has been described.

Under proper treatment, children suffering from this derangement usually do well; although sometimes the fears excited by their gradually increasing pallor and weakness, and their progressive emaciation, are actually realized. Pneumonia attacking such patients is apt to be of the epithelial variety—the so-called scrofulous pneumonia; and the deposit, after remaining unabsorbed for a variable time, generally undergoes disintegration, forming one of the many varieties of pulmonary phthisis. If the formation of gray tubercle occur at all in such cases, the coincidence must be looked upon as accidental, for the disease in question is quite distinct from the tuberculous diathesis and independent of it.

In the *treatment* of this derangement, the mucus already secreted must be cleared away by a purgative of rhubarb and jalap. After which, various measures must be resorted to for restraining the excessive secretion of mucus, and for restoring healthy nutrition. This is to be done by a strictly regulated diet and by a careful hygiene, at least as much as by the administration of medicines. All articles of food must be forbidden in which fermentation can be excited by the presence of the alkaline mucus; and therefore farinaceous matters, sugars, and fats should be rigidly excluded from the diet. The child should be fed as nearly as possible upon meat, eggs, and milk. It is true that bread can seldom be entirely dispensed with, but what little is allowed must be eaten stale or well toasted. Too much food must not be given at once, for all overloading of the stomach is to be avoided. It is better to distribute the amount allowed over four meals rather than three, and these should be fixed at regular intervals throughout the day. When the derangement has existed for some time, and the general nutrition of the body is much lowered, the appetite usually fails. In these cases it is often difficult to persuade the child to take nourishment, especially as his chief craving is for bread-and-butter, potatoes, and all the different articles of food which are particularly injurious. Meat is often extremely distasteful to him. A lark or a snipe will, however, by appealing to his fancy, sometimes overcome this dislike; and every means should be tried, by varying his diet within the prescribed limits, to induce him to take a sufficient quantity of food. At the same time, the patient should be warmly clothed, and should take plenty of exercise in the open air. If the weather be mild, almost the whole day should be passed out of doors. The child should wear a shirt and drawers of flannel, and his belly should have the additional protection of a broad flannel belt. To restore the proper action of the skin, the whole body should be sponged with tepid water in a bath every morning, and should be afterwards well rubbed with towels or a flesh-glove until the skin is all aglow. The frictions may be repeated, without the bath, in the evening before going to bed. In cases where the skin is particularly dry and shrivelled-looking, Dr. Andrew Clark recommends that a warm bath should be taken at night, and that the body should then be freely anointed with oil. Under such treatment the skin quickly recovers its natural appearance, and becomes soft and supple. The above measures—even if no medicines have been given at all—will, after a very short time, produce a marked improvement in the appearance of the child. The stoppage of starchy food, and especially of potatoes, will by itself remove a great many of the more distressing symptoms; the restlessness at night, in particular, usually ceases at once. There are, however, certain medicines which should not be neglected: but those most calculated to assist the object we have in view are not those which, under the name of *tonics*, are usually resorted to when from any cause healthy nutrition of the body appears to be in abeyance. The best tonic is nourishing food. But that the food taken may be nourishing, it must first of all be digested; and those medicines will be therefore the real tonics which enable the alimentary canal properly to perform its functions. Our object is to check as rapidly as possible the excessive secretion of mucus, which prevents the food from being sufficiently mixed with the digestive fluids, and impedes the action of the absorbent vessels. Various medicines will accomplish this result. Thus, alkalies not only appear to have an influence in arresting the secretion of mucus, but also, by at once neutralizing any acid formed by the fermentation of food, produce a rapid change for the better in the general symptoms. The best form in which they can be given is the bicarbonate of soda with a bitter, as the infusion of calumba. To each dose may be added half a grain of iodide of potassium, to increase the salivary secretion, and twenty drops of the tincture of myrrh, which is found to have a powerful bracing effect upon the mucous membrane. The mineral acids—at any rate in severe cases of this derangement—often appear to be rather injurious than beneficial; certainly the improvement under their use is not nearly so rapid as in cases where alkalies are used. The influence of the latter in improving the appetite, when that is failing, is most marked, especially if a drop or two of dilute hydrocyanic acid be added to each dose of the mixture, and will often succeed when dilute nitric acid has been given without any effect. Aloes is also a most valuable medicine. Under its use the amount of mucus appearing in the stools diminishes rapidly, the digestion improves, and all the symptoms showing irritability of the nervous system—such as restlessness at night, bad dreams, startings, grinding of the teeth, moroseness and ill-temper—quickly subside. The effect upon the rest at night is usually most marked, the child beginning to sleep soundly after only a few doses of the drug. Aloes is most conveniently given in the form of the compound decoction, in doses of two teaspoonfuls three times in the day, for a child of seven years old. In such quantities it does not act as a purgative, but merely produces a tonic effect upon the bowels, checking immoderate secretion. Decoction of oak-bark, in half-ounce doses, will also be found of service.

In cases where the emaciation and debility are very decided, iron may be combined with the special treatment; for although tonics, when given alone, are found to be of slight advantage so long as the functional derangement of the alimentary canal continues marked, yet in combination with medicines directed especially to rectify that derangement, iron is often of much use. Thus, the ammonio-citrate of iron may be given with aromatic spirits of ammonia in the alkaline mixture, or a teaspoonful of iron wine may be added to each dose of the decoction of aloes.

While these medicines are being taken a purgative of rhubarb and jalap should be given fasting twice a week. Afterwards, when mucus has ceased to appear in the stools, and all symptoms of digestive disturbance have disappeared, quinine, the mineral acids, cod-liver oil, &c., may be given. if they are thought to be required; but these are seldom necessary to complete the cure.

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